

THE DEER
OF ALL LANDS

R. LYDEKKER

MUSEUM OF VICTORIA



31729

THE DEER OF ALL LANDS

THIS EDITION CONSISTS OF FIVE HUNDRED COPIES, NUMBERED AND SIGNED,
OF WHICH THIS IS

No. 292

Rowland Ward

9.7.13
NATURAL HISTORY MUSEUM

THE
DEER OF ALL LANDS

A HISTORY OF THE FAMILY CERVIDÆ
LIVING AND EXTINCT

BY
R. LYDEKKER



LONDON
ROWLAND WARD, LIMITED

1898

TO
THE DUCHESS OF BEDFORD
THIS ACCOUNT
OF A GROUP OF ANIMALS
IN WHICH
HER GRACE TAKES A SPECIAL INTEREST
IS DEDICATED
BY
THE AUTHOR

PREFACE

MANY groups of animals are of interest chiefly or solely to the naturalist, but those coming under the designation of big game claim a much more extensive list of admirers. And among these the members of the deer tribe occupy not the least important position. Not only are the majority objects of eager pursuit to the sportsman, but three are denizens of our larger British parks, and two of these are the only British representatives of big game. Moreover, many of them are capable of more or less complete acclimatisation in this country, and in that condition add largely to the attractions of our deer parks.

It is now many years since a complete monograph of the existing members of the group has appeared, among the latest being one by the late Sir Victor Brooke in 1878, and a second by the late Dr. L. J. Fitzinger, which, although commenced in 1873, was not completed till 1879. Since these dates several new species have been described, and much revision of others, as well as of the general grouping, has taken place. And the present volume is an attempt to bring up to date the existing state of our knowledge of an exceedingly difficult group. Although the author has availed himself of all the accessible means of information, there are still many points requiring further elucidation, and much is necessarily left for future investigation.

Since the author is a palæontologist first and a zoologist second, he could not treat the subject without some reference to the extinct members of the family. Many of these, however, have been named on the evidence of such unsatisfactory fragments that nothing would be gained by their mention

here ; and the notices of extinct species are consequently limited to such as can be located among the existing forms with a fair approximation to certainty.

Being essentially popular in its treatment of the subject, the work makes no pretence to rank as a strictly scientific treatise, and should not therefore be judged from such a standard. Anatomical details and technical terms are in most cases so far as possible avoided. For instance, the characters of the skull are in general not mentioned ; but in a scientific work it would have to be stated that the common American deer and its numerous local races are easily distinguished from the mule-deer by the shallowness of the pits in the skull for the reception of the face-glands. In spite of its popular treatment, it is nevertheless probable that the professed naturalist will not fail to find much matter of interest, and possibly some aid in his investigations.

An exceedingly difficult and unsatisfactory part of the subject has been that relating to scientific nomenclature. And both the sportsman and the amateur naturalist will probably be disagreeably surprised to find a large proportion of the species figuring under titles with which they are totally unfamiliar. At the present time zoological nomenclature is undergoing a complete revolution, the currently accepted idea being that the names first given to animals must be used, unless they have been previously employed in another sense, or there is some other bar to their employment. With some misgivings, the author has felt it advisable in the main to follow this ruling, although he cannot at present reconcile himself to the use of duplicative titles, such as *Capreolus capreolus*. Moreover, when a specific title indicates a geographical error, it is rejected. And the same course is followed when a name is founded on a misconception. An instance of the latter kind is afforded by the name *Hippocamelus*, given to the Chilian guemal on the supposition that it was intermediate between a horse and a llama. In this case the name *Mazama*, although later, is selected for use.

In view of these changes, special prominence has been given in this volume to the popular titles of the various species, which are less subject to such emendations, and these alone have been employed in the legends to the plates and text-figures.

A new feature in the treatment of the group is the large number of forms ranked as sub-species, or races, instead of as full species. The principle of this is that when certain representatives of a genus, or a group of a genus, are more nearly allied to one another than they are to the other members of the same, they are regarded as sub-species. The Asiatic and American wapitis, for instance, are obviously more closely related to one another than they are to the red deer, while the Caspian maral and the North African deer come nearer to the latter than to any other members of the same group. Consequently all the forms of wapiti are classed as geographical races of a single variable and widely spread specific type; while the European, the Caspian, and the North African red deer are ranked as sub-species of a second. In like manner the numerous modifications of the sambar type show mutual resemblances not shared either by the chital or the para, and all the former are accordingly brigaded under one specific title. Although in some cases such geographical races, or sub-species, may pass imperceptibly into one another, the absence of intergradation is not considered any bar to classing any particular form as a sub-species. Where such sub-species are separated by the ocean, such intergradation must obviously have ceased after the disruption of the land connection between their respective habitats.

Generic terms are likewise, for the most part, used in a wide sense, although they are frequently split up into minor groups, or sub-genera, which many writers would probably prefer to rank as genera. If, however, genera are used in a more restricted sense we are very apt to lose sight of many broad generalisations. For instance, if *Cervus* be split up, we lose sight of the fact that all the large brow-antlered deer are essentially an Old World type, with western representatives in the American wapitis. And

similarly, if the American deer be referred to two or more genera, the fact that all the deer peculiar to the New World are characterised by the possession of antlers of the bifurcate type, accompanied by the division of the nasal passage of the skull into two chambers, is not obvious.

The author's personal acquaintance with the animals of which he treats is by no means equal throughout. It is least in the smaller deer of Central and South America, and it is consequently among these that subsequent revision will probably be most necessary.

To the kindness of numerous friends the author is greatly indebted for much valuable assistance in various ways during the progress of the work, and to all of these his best thanks are collectively tendered. Special mention must, however, be made of his indebtedness to the Duke and Duchess of Bedford, whose unrivalled collection of living deer at Woburn Abbey has been unreservedly placed at his disposal for study. It was owing to this collection that the idea of the work originated, and without it there would have been no possibility of bringing the history of this group of animals to such approach to completeness as it may haply possess.

To the Duchess herself the author's especial thanks are likewise due for the exquisite photographs of many specimens and groups in the collection at Woburn with which the work is embellished. Not the least interesting among them being the series of antlers of individual deer at different ages.

Neither must mention be omitted of the care and attention bestowed by Mr. Smit on the execution of the coloured lithographs, many of which have been drawn from living examples in the collection at Woburn Abbey, while others have been taken from specimens in the Zoological Society's Menagerie.

HARPENDEN, 1st March 1898.

CONTENTS

PART I.—INTRODUCTORY

	PAGE
DEFINITION OF DEER	I
ANTLERS	5
OTHER STRUCTURAL FEATURES	11
CLASSIFICATION	16
DISTRIBUTION	22
HABITS	27
ECONOMIC USES	30

PART II.—DESCRIPTIVE

A. THE TRUE DEER—Sub-Family <i>Cervinæ</i>	32
I. REINDEER—Genus <i>Rangifer</i>	33
The Reindeer, or Caribou— <i>Rangifer tarandus</i>	37
<i>a.</i> Scandinavian Race— <i>Rangifer tarandus typicus</i>	38
<i>b.</i> Spitzbergen Race— <i>Rangifer tarandus spetzbergensis</i>	41
<i>c.</i> Woodland Race— <i>Rangifer tarandus caribou</i>	42
<i>d.</i> Newfoundland Race— <i>Rangifer tarandus terræ-novæ</i>	45
<i>e.</i> Greenland Race— <i>Rangifer tarandus grænländicus</i>	47
<i>f.</i> Barren-Ground Race— <i>Rangifer tarandus arcticus</i>	47
II. ELK—Genus <i>Alces</i>	49
1. The Elk, or Moose— <i>Alces machlis</i>	52
2. Johnson's Elk— <i>Alces latifrons</i> (extinct)	59
3. Scott's Elk— <i>Alces scotti</i> (extinct)	60
III. THE TYPICAL DEER—Genus <i>Cervus</i>	61
i. The Red Deer, or Elaphine Group—Sub-Genus <i>Cervus</i>	62
1. The Red Deer— <i>Cervus elaphus</i>	64
<i>a.</i> European Race— <i>Cervus elaphus typicus</i>	65
<i>b.</i> Corsican Race— <i>Cervus elaphus corsicanus</i>	74
<i>c.</i> North African Race— <i>Cervus elaphus barbarus</i>	74
<i>d.</i> Caspian Race— <i>Cervus elaphus maral</i>	75

III. THE TYPICAL DEER— <i>continued</i>	PAGE
2. The Duke of Bedford's Deer— <i>Cervus xanthopygus</i>	81
3. The Hangul— <i>Cervus cashmirianus</i>	83
<i>a.</i> Kashmir Race— <i>Cervus cashmirianus typicus</i>	85
<i>b.</i> Yarkand Race— <i>Cervus cashmirianus yarcandensis</i>	88
4. The Shou— <i>Cervus affinis</i>	88
5. Thorold's Deer— <i>Cervus albirostris</i>	91
6. The Wapiti— <i>Cervus canadensis</i>	94
<i>a.</i> East American Race— <i>Cervus canadensis typicus</i>	96
<i>b.</i> West American Race— <i>Cervus canadensis occidentalis</i>	101
<i>c.</i> Manchurian Race— <i>Cervus canadensis luehdorfi</i>	102
<i>d.</i> Altai Race— <i>Cervus canadensis asiaticus</i>	104
7. The Bokhara Deer— <i>Cervus</i> sp.	108
ii. The Sikine Group—Sub-Genus <i>Pseudaxis</i>	110
1. The Common Sika— <i>Cervus sica</i>	111
<i>a.</i> Japanese Race— <i>Cervus sica typicus</i>	112
<i>b.</i> Manchurian Race— <i>Cervus sica manchuricus</i>	114
2. The Formosan Sika— <i>Cervus taëvanus</i>	116
3. The Pekin Sika— <i>Cervus hortulorum</i>	117
4. Mandarin Sika— <i>Cervus mandarinus</i>	121
5. The Pliocene Sika— <i>Cervus perrieri</i> (extinct)	122
Incertæ Sedis— <i>Cervus pseudaxis</i>	123
iii. The Damine Group—Sub-Genus <i>Dama</i>	125
1. The Common Fallow Deer— <i>Cervus dama</i>	127
2. Brown's Fallow Deer— <i>Cervus browni</i> (extinct)	131
3. The Mesopotamian Fallow Deer— <i>Cervus mesopotamicus</i>	132
4. The Giant Fallow Deer— <i>Cervus giganteus</i> (extinct)	134
<i>a.</i> German Race— <i>Cervus giganteus ruffi</i>	136
<i>b.</i> Irish Race— <i>Cervus giganteus typicus</i>	137
<i>c.</i> Italian Race— <i>Cervus giganteus italiae</i>	139
<i>d.</i> French Race— <i>Cervus giganteus belgrandi</i>	139
<i>e.</i> Forest-bed Race— <i>Cervus giganteus carnutorum</i>	140
iv. The Rusine or Sambar Group—Sub-Genus <i>Rusa</i>	141
1. The Sambar— <i>Cervus unicolor</i>	144
<i>a.</i> Indian Race— <i>Cervus unicolor typicus</i>	146
<i>b.</i> Malayan Race— <i>Cervus unicolor equinus</i>	150
<i>c.</i> Formosan Race— <i>Cervus unicolor swinhoei</i>	154
<i>d.</i> Szechuan Race— <i>Cervus unicolor dejeani</i>	156
<i>e.</i> Luzon Race— <i>Cervus unicolor philippinus</i>	157
<i>f.</i> Basilan Race— <i>Cervus unicolor nigricans</i>	158
2. The Rusa, or Javan Sambar— <i>Cervus hippelaphus</i>	162
<i>a.</i> Javan Race— <i>Cervus hippelaphus typicus</i>	164
<i>b.</i> Moluccan Race— <i>Cervus hippelaphus moluccensis</i>	166
<i>c.</i> Timorese Race— <i>Cervus hippelaphus timoriensis</i>	170

Contents

xiii

III. THE TYPICAL DEER —continued	PAGE
3. The Philippine Spotted Deer — <i>Cervus alfredi</i>	172
4. The Calamianes Deer— <i>Cervus culionensis</i>	173
5. The Bavian Deer— <i>Cervus kuhli</i>	174
6. The Para, or Hog-Deer — <i>Cervus porcinus</i>	175
7. The Chital, or Indian Spotted Deer— <i>Cervus axis</i>	179
Incertæ Sedis — <i>Cervus lepidus</i>	185
<i>Cervus caspicus</i>	186
v. The Rucervine Group — Sub-Genus <i>Rucervus</i>	188
1. The Swamp-Deer — <i>Cervus duvauceli</i>	189
2. Schomburgk's Deer— <i>Cervus schomburgki</i>	193
3. The Thameng — <i>Cervus eldi</i>	195
<i>a.</i> Burmese Race— <i>Cervus eldi typicus</i>	200
<i>b.</i> Siamese Race— <i>Cervus eldi platyceros</i>	200
4. The Siwalik Swamp-Deer— <i>Cervus siwalensis</i> (extinct)	201
IV. THE MUNTJACS—Genus <i>Cervulus</i>	202
1. The Indian Muntjac — <i>Cervulus muntjac</i>	203
2. The Tibetan Muntjac— <i>Cervulus lachrymans</i>	208
3. The Chinese Muntjac— <i>Cervulus reevesi</i>	208
4. The Tenasserim Muntjac— <i>Cervulus feæ</i>	209
5. The Hairy-fronted Muntjac — <i>Cervulus crinifrons</i>	210
V. THE TUFTED DEER—Genus <i>Elaphodus</i>	212
1. The Tibetan Tufted Deer — <i>Elaphodus cephalophus</i>	213
2. Michie's Tufted Deer — <i>Elaphodus michianus</i>	214
VI. THE MIOCENE MUNTJACS—Genus <i>Dremotherium</i> (extinct)	215
1. Hensel's Muntjac— <i>Dremotherium furcatum</i>	217
2. Kaup's Muntjac — <i>Dremotherium anoceros</i>	217
VII. THE TUSKLESS MUNTJACS — Genus <i>Dicroceros</i> (extinct)	218
The Sansan Muntjac — <i>Dicroceros elegans</i>	219
VIII. THE WATER-DEER — Genus <i>Hydrelaphus</i>	219
The Chinese Water-Deer— <i>Hydrelaphus inermis</i>	221
IX. THE ROES—Genus <i>Capreolus</i>	222
1. The European Roe — <i>Capreolus vulgaris</i>	223
2. The Siberian Roe— <i>Capreolus pygargus</i>	227
3. The Manchurian Roe— <i>Capreolus manchuricus</i>	231
4. The Pliocene Roe— <i>Capreolus cusanus</i> (extinct)	232
X. THE MILOU DEER—Genus <i>Elaphurus</i>	233
Père David's Milou Deer— <i>Elaphurus davidianus</i>	236

	PAGE
XI. GENUS <i>ANOGLOCHIS</i> (extinct)	238
1. The Ardé Deer— <i>Anoglochis ardeus</i>	239
2. Sedgwick's Deer— <i>Anoglochis sedgwicki</i>	240
3. The Five-tined Deer— <i>Anoglochis tetraceros</i>	242
XII. THE AMERICAN DEER—Genus <i>Mazama</i>	243
i. The Dorcelaphine Group—Sub-Genus <i>Dorcelaphus</i>	248
1. The Common American Deer— <i>Mazama americana</i>	249
<i>a.</i> Virginian Race— <i>Mazama americana typica</i>	252
<i>b.</i> Western Race— <i>Mazama americana macrura</i>	257
<i>c.</i> Florida Race— <i>Mazama americana osceola</i>	259
<i>d.</i> Sonoran Race— <i>Mazama americana couesi</i>	261
<i>e.</i> Texan Race— <i>Mazama americana texana</i>	261
<i>f.</i> Mexican Race— <i>Mazama americana mexicana</i>	261
<i>g.</i> Yucatan Race— <i>Mazama americana tolteca</i>	263
<i>h.</i> Central American Race— <i>Mazama americana nemoralis</i>	264
<i>i.</i> Colombian Race— <i>Mazama americana gymnotis</i>	266
<i>j.</i> Savanna Race— <i>Mazama americana savannarum</i>	267
<i>k.</i> Peruvian Race— <i>Mazama americana peruviana</i>	268
2. True's Deer— <i>Mazama truei</i>	268
3. Crooke's Black-tailed Deer— <i>Mazama crookei</i>	268
4. The Mule-Deer— <i>Mazama hemionus</i>	269
<i>a.</i> Typical Race— <i>Mazama hemionus typica</i>	275
<i>b.</i> Californian Race— <i>Mazama hemionus californica</i>	276
<i>c.</i> La Paz Race— <i>Mazama hemionus peninsulæ</i>	276
<i>d.</i> Western Desert Race— <i>Mazama hemionus eremica</i>	277
4. The Black-tailed Deer— <i>Mazama columbiana</i>	278
Incertæ Sedis— <i>Mazama spinosa</i>	280
<i>Mazama similis</i>	281
<i>Mazama leptocephala</i>	281
<i>Mazama pusilla</i>	281
<i>Mazama</i> sp.	281
ii. The Guazu Group—Sub-Genus <i>Blastoceros</i>	282
1. The Marsh-Deer— <i>Mazama dichotoma</i>	283
2. The Pampas Deer— <i>Mazama bezoartica</i>	287
3. The Lujan Marsh-Deer— <i>Mazama brachyceros</i> (extinct)	291
4. The Buenos Aires Marsh-Deer— <i>Mazama ultra</i> (extinct)	292
5. Ameghino's Marsh-Deer— <i>Mazama fragilis</i> (extinct)	293
iii. The Guemal Group—Sub-Genus <i>Xenelaphus</i>	293
1. The Peruvian Guemal— <i>Mazama antisimensis</i>	295
2. The Chilian Guemal— <i>Mazama bisulca</i>	296
3. The Plistocene Guemal— <i>Mazama senclitica</i> (extinct)	298
iv. The Typical, or Brocket Group—Sub-Genus <i>Mazama</i>	298
1. The Red Brocket— <i>Mazama rufa</i>	300

Contents

xv

XII. THE AMERICAN DEER— <i>continued</i>	PAGE
2. The Streak-eyed Brocket— <i>Mazama superciliaris</i>	301
3. The Black-faced Brocket— <i>Mazama temia</i>	302
4. The Central American Brocket— <i>Mazama sartorii</i>	303
5. The Wood Brocket— <i>Mazama nemorivaga</i>	303
6. The Peruvian Brocket— <i>Mazama tschudii</i>	305
7. The Pigmy Brocket— <i>Mazama nana</i>	305
Incertæ Sedis— <i>Mazama inornata</i>	306
<i>Mazama aurita</i>	306
XIII. THE PUDU—Genus <i>Pudua</i>	307
1. The Chilean Pudu— <i>Pudua pudu</i>	307
2. The Ecuador Pudu— <i>Pudua mephistopheles</i>	308
B. THE ABERRANT DEER—Sub-Family <i>Moschinæ</i>	309
XIV. THE MUSKS—Genus <i>Moschus</i>	310
1. The Himalayan Musk— <i>Moschus moschiferus</i>	311
2. The Kansu Musk— <i>Moschus sifanicus</i>	315
APPENDIX—Bibliography of the <i>Cervidæ</i>	317
INDEX	325

LIST OF PLATES

PLATE

1. SCANDINAVIAN REINDEER. From a male in the London Zoological Gardens	<i>To face page</i> 38
2. ELK. From a male in the London Zoological Gardens	52
3. DUKE OF BEDFORD'S DEER. From an immature male in summer pelage, recently living at Woburn Abbey	81
4. KASHMIR HANGUL. From a male specimen in the British Museum	83
5. THOROLD'S DEER. From a male in the British Museum	91
6. ALTAI WAPITI. From a male in winter pelage in the Menagerie at Woburn Abbey	105
7. MANCHURIAN SIKA. From males in winter pelage in the Menagerie at Woburn Abbey	111
8. FORMOSAN SIKA. From a male in winter pelage in the Menagerie at Woburn Abbey	116
9. PEKIN SIKA. From immature specimens in very early winter pelage at Woburn Abbey	117
10. INDIAN SAMBAR. From a male and female in winter pelage at Woburn Abbey	146
11. MALAYAN SAMBAR. From a young male in winter pelage recently living at Woburn Abbey	151
12. MOLUCCAN RUSA. From a male in winter pelage in the British Museum, formerly living at Woburn Abbey	162
13. CHITAL. From males at Woburn Abbey	179
14. SWAMP-DEER. From a male specimen in the British Museum	190
15. SIAMESE THAMENG. From a Hainan male in early winter pelage in the London Zoological Gardens	200
16. TENASSERIM AND HAIRY-FRONTED MUNTJACS. From the figures of the type specimens	209
17. MICHIE'S TUFTED DEER AND CHINESE WATER-DEER. From male specimens in the British Museum	214
18. EUROPEAN ROE. From male specimens in the British Museum, in summer and winter pelage	224

PLATE

19. PÈRE DAVID'S MILOU DEER. From a male living in the Menagerie at Woburn Abbey	<i>To face page 236</i>
20. VIRGINIAN DEER. From a male in the London Zoological Gardens	„ 252
21. MULE-DEER. From a male in the London Zoological Gardens	„ 270
22. PAMPAS DEER. From a young male (the antlers added) from Sante Fé, formerly living at Woburn Abbey	„ 288
23. PERUVIAN GUEMAL. From a male in the British Museum	„ 295
24. CENTRAL AMERICAN BROCKET AND ECUADOR PUDU. From examples in the British Museum	„ 303

TEXT FIGURES

FIG.	PAGE
1. Group of Deer at Woburn Abbey	7
2. Another group	7
3. Antlers of Caspian Red Deer	9
4. Map of Distribution of Deer	23
5. Head of Chital	31
6. Antlers of Woodland Reindeer	34
7. Skull and Antlers of Woodland Reindeer	43
8. Head of Newfoundland Reindeer	46
9. Antlers of Barren-Ground Reindeer	48
10. Frontlet and Antlers of Elk	50
11. Skull and Antlers of Elk	53
12. Antlers of Elk	55
13. Elk at Woburn Abbey	57
14. Skull and Antlers of Scott's Elk	60
15. Antlers of Red Deer from Germany	61
16. Antlers of Red Deer from Scotland	63
17. Group of Red Deer at Woburn Abbey	64
18. Antlers of Red Deer from Moritzburg Castle	67
19. Frontlet and Antlers of Red Deer from Exmoor	69
20. A Red Deer at Woburn Abbey	71
21. Head of Caspian Red Deer	76
22. Head of Hangul	84
23. Skull and Antlers of Shou	89
24. Head of East American Wapiti	95
25. East American Wapiti	97
26. Manchurian Wapiti Hind	103
27. Altai Wapiti	106
28. Bokhara Deer	109
29. Antlers of Japanese Sika	110
30. Buck and Doe of Manchurian Sika	115
31. Head of Pekin Sika	118
32. Fallow Deer at Woburn Abbey	126
33. Head of Common Fallow Deer	128
34. Head of Mesopotamian Fallow Deer	133
35. Skull and Antlers of Irish Race of Giant Fallow Deer	135
36. Skull and Antlers of variety of German Race of Giant Fallow Deer	137

FIG.	PAGE
37. Antlers of Irish Race of Giant Fallow Deer at various ages	139
38. Frontlet and Antlers of Indian Sambar	143
39. Frontlet and Antlers of Malayan Sambar	152
40. Formosan Sambar	155
41. Skull and Antlers of Javan Rusa	163
42. Javan Rusa	165
43. Moluccan Rusa	167
44. Antlers of Moluccan Rusa at various ages	169
45. Undetermined Rusine Deer	171
46. Head of Hog-Deer	176
47. Hog-Deer in Summer Pelage	178
48. Antlers of Chital at various ages	180
49. Skull and Antlers of Chital	182
50. Male and Female Chital	184
51. Frontlet and Antlers of Swamp-Deer	190
52. Skull and Antlers of Swamp-Deer	192
53. Frontlet and Antlers of Schomburgk's Deer	194
54. Frontlet and Antlers of Burmese Thameng	197
55. Group of Burmese Thameng	199
56. Frontlet and Antlers of Indian Muntjac	205
57. Head of Hairy-Fronted Muntjac	211
58. Head of Michie's Tufted Deer	214
59. Frontlet and Antlers of Hensel's Muntjac	218
60. Head of Siberian Roe	225
61. Antlers of Siberian Roe	228
62. Abnormal Antlers of Siberian Roe	229
63. Père David's Milou Deer	234
64. Series of Antlers of Milou Deer	235
65. Antlers of Ardé Deer	239
66. Antlers of Sedgwick's Deer	241
67. Antlers of Five-Tined Deer	243
68. Antlers of Virginian Deer	246
69. Frontlet and Antlers of Virginian Deer	250
70. Florida Deer	260
71. Head of Mule-Deer	270
72. Another specimen of the same	273
73. Antlers of Marsh-Deer	284
74. Young Marsh-Deer	285
75. Malformed Antlers of Marsh-Deer	286
76. Young Male Pampas Deer	290
77. Antler of Lujan Marsh-Deer	292
78. Antler of Ameghino's Marsh-Deer	293
79. Musk Deer	313
80. Skull and Antlers of Caspian Red Deer	323

THE DEER OF ALL LANDS

A HISTORY OF THE FAMILY CERVIDÆ

PART I.—INTRODUCTORY

DEFINITION OF DEER

POPULAR and scientific zoology are by no means always in accord, and an instance of this want of harmony is afforded by the different limitations of the popular term "deer" on the one hand, and the scientific title *Cervidæ* on the other. Both, indeed, relate to the same group of animals, and are therefore to a great extent synonymous, but whereas the chevrotains, or mouse-deer, are popularly ranked as members of the deer tribe, they are excluded by naturalists from the family *Cervidæ*. There is evidently, therefore, some character, or characters, not apparent to the popular mind, which the scientific naturalist regards of primary importance in the definition of the family *Cervidæ*. And it is accordingly necessary to come to a definite conclusion as to the limits of that family. In other words, we have to seek a definition of the term "deer" in its scientific sense.

This is by no means such an easy matter as might on first thoughts seem probable. The males of the more typical members of the group, such as the red and fallow deer, are furnished with the graceful branching and deciduous appendages now generally known as antlers. And if these were present in all (as they are in most) deer, there would be no difficulty at all in formulating a concise and distinctive definition of the family. These appendages are, however, lacking in the Chinese water-deer, which is in every respect a true deer, and they are also wanting in the more aberrant musk, as they likewise are in a number of species now

extinct. It is manifest, therefore, that antlers, although very important, are not alone sufficient to define the *Cervidæ*. More especially is this the case when extinct types have to be reckoned with (and without these there is no possibility of arriving at the true affinities of a group); for not only are there antlerless deer, but there are other kinds in which these appendages were never shed, and seem to have been permanently invested with the skin, or "velvet." Nor is this all, for there were certain extinct ruminants more or less intimately allied to the giraffes, whose heads were crowned with branching bony appendages apparently agreeing in all respects with the antlers of the modern deer, except that they were never shed, and may have remained in the velvet throughout life.

As every one knows, deer are members of the great group, or order, of hoofed mammals, or *Ungulata*. The more typical representatives of this great order are divided into two minor divisions, or sub-orders, distinguished from one another most readily by the structure of the feet. In the one sub-order, or *Perissodactyla*, the toe corresponding to the middle (third) finger or toe of the human hand or foot is symmetrical in itself, and, as in the horse, may be the only one remaining. The living representatives of this sub-order are the horses, zebras, asses, tapirs, and rhinoceroses; none of which are at all likely to be confused with deer.

On the other hand, in the second great sub-ordinal group, or *Artiodactyla*, the two toes respectively representing the third and fourth fingers and the corresponding toes of man are symmetrical to a line drawn between them, and unsymmetrical in themselves. This type of foot-structure when most fully developed constitutes the familiar "cloven hoof." In its extreme development, as in the giraffes and many antelopes, only one pair of large hoofs remain to each foot; but in the majority of the group a smaller pair of lateral hoofs exist, which, as in the reindeer and the pigs, may be functional, or, as in the roes, may be very minute and quite useless.

Having established the fact that deer are members of the *Artiodactyla*, we have to find their position in that extensive group, which likewise includes hippopotami, pigs, peccaries, chevrotains, camels, giraffes, the prong-buck, antelopes, goats, sheep, and oxen, together with a whole host of extinct forms. Neglecting the latter, this can be best effected by a process of elimination.

First, we may eliminate the hippopotami, pigs, and peccaries by the

structure of their teeth ; all these animals having incisor teeth in the front of the upper jaw, while their molars, or cheek-teeth, are surmounted by low, more or less conical, or trefoil-shaped tubercles. On the other hand, the members of the other groups mentioned above resemble one another in that the grinding surfaces of the crowns of their hinder cheek-teeth culminate in half-cylinders, of which there are usually four in each upper, and two in each lower tooth, with the exception of the last, where there are generally three. With this type of cheek-tooth is associated a complex stomach, with at least three distinct compartments, and the function of chewing the cud, or ruminating. Consequently all the members of the assemblage are commonly known as ruminants.

From this group may be eliminated the camels and llamas on account of the cushion-like structure of their feet, the presence of at least one pair of incisor teeth in the upper jaw, and the circumstance that the stomach has but three compartments. In all the others there are no upper incisor teeth, although the canines, or tusks, frequently persist, and may attain large dimensions. The chevrotains, or mouse-deer, which resemble the camels in the absence of either horns or antlers, are externally very like small antlerless deer ; but they differ from all the existing members of that group in that the stomach has but three compartments, and also by the circumstance that the lateral hoofs of the fore-feet have complete supporting bones (the metacarpals) extending throughout the whole length of each side of the cannon-bone, or the main bone of the lower segment of the leg.

There now remain for elimination the giraffes, forming the family *Giraffidæ* ; the prong-buck, which alone represents the *Antilocapridæ* ; and the antelopes, goats, sheep, and oxen, collectively constituting the *Bovidæ*, or hollow-horned ruminants. Together with the deer, these three family groups are characterised by the absence of upper incisor teeth, the presence of four distinct compartments to the stomach, and the incompleteness or absence of the lateral metacarpal bones supporting the front lateral hoofs and their basal joints. The whole group of four families, which have many other characters in common, collectively constitute the true ruminants, or *Pecora*. It is here that the real difficulty in defining the deer tribe begins.

The *Giraffidæ*, so far as their living representatives are concerned, are very closely allied to the deer, from which they differ by the appendages of

the skull taking the form of unbranched bony pedicles, which are at first separate from the bones supporting them, and are permanently covered with skin. Lateral hoofs, which are present in all deer, are completely absent, as are also upper canine teeth. In the structure of the skull, and the general absence of a gall-bladder to the liver, giraffes closely resemble deer. Moreover, many extinct members of the giraffe family had large branching appendages simulating the antlers of the elk, but these were not periodically shed, and may have been covered either with skin or with deciduous horny sheaths. Several of these animals had two pairs of horns, either rising separately from the skull or springing from a common base; and in this respect they were unlike any known deer. Nevertheless, the kinship between the deer and the giraffes is evidently very close.

The prong-buck—*Antilocapra*—is easily differentiated from the deer by the appendages of the skull forming simple bony cores clothed with a forked horny sheath which is shed annually. A very similar type of appendage characterises the *Bovidae*, the difference being that the horny sheath is not forked, and is never shed. With the exception of certain domesticated races, and some extinct forms, such horns are present in the males, at least, of all species; and thus at once serve to distinguish between this family and the *Cervidae*. In nearly all cases the liver has a gall-bladder; upper canine teeth are invariably absent; and when any traces of the lateral metacarpal bones remain, their lower extremities are always wanting. The muzzle may be either naked or hairy; and a gland on each side of the face below the eye may or may not be present.

Coming to the *Cervidae*, we find that in all existing forms, with the exception of the Chinese water-deer and the musks, antlers (of which the nature is explained below) are present in the males, but are absent in the females of all the species except the reindeer. Save in the musk, there is a face-gland below the eye, and in the skull a vacuity in this region between the lachrymal and nasal bones; both these being absent in a large number of the *Bovidae*. The lateral hoofs are invariably retained; and, except in the muntjacs, these lateral hoofs are always supported by the usual three joints, or phalanges, of which the first and second are always wanting in the *Bovidae*. Moreover, the lateral metacarpal bones are always represented by either their upper or lower ends, the latter of which are never found in the *Bovidae*. With the exception of the reindeer, some portion of the muzzle

is devoid of hair, although in the elk the naked area is reduced to a very small patch. Upper canine teeth are frequently present, and in those species devoid of antlers attain large dimensions. Lastly, with the exception of the musks, the liver has no gall-bladder. Certain characters connected with the internal reproductive organs of the female need not be referred to on this occasion.

The deer tribe may accordingly be concisely defined as *Pecora* presenting the following characters. Either antlers are present in the male, or when these are absent the upper canines are large and sabre-like, and the lateral metacarpal bones are represented by their lower extremities. This definition will include not only the living, but also most of the extinct forms, although in some of the latter the lateral metacarpal bones not only retain their lower ends, but are complete in their entire length. At the same time it must be mentioned that when we have to deal with the earliest and most generalised forms we find some of these presenting characters common to the *Bovidæ*, *Giraffidæ*, and *Tragulidæ* (chevrotains); but this is only what we should expect to be the case in the common ancestral forms of all these groups.

Antlers.—As the most characteristic feature of the deer tribe, special attention must be directed to the appendages which are best termed antlers. Many writers call these appendages horns, and probably this is etymologically correct, since it appears that the word “antler” is derived from the Old French *antoiller*, a derivative of the Late Latin *antoculorum*; this term having been originally applied to what is now called the brow-tine. Still it is so convenient to have a distinctive term for the cranial appendages of the deer, as distinct from the sheath-covered horns of the *Bovidæ*, that the use of the word “antler” in this sense is most desirable.

Antlers are supported on a pair of solid bony processes, or pedicles, arising from the frontal bones of the skull, of which they form an inseparable portion; and if in a fully adult deer these pedicles be sawn through, they will generally be found to consist of solid, ivory-like bone, devoid of perceptible channels for the passage of blood-vessels. The pedicles are always covered with skin well supplied with blood-vessels; and in young deer, or those in which the antlers have been comparatively recently shed, the covering of skin extends over their summits, when they appear as longer or shorter projections on the forehead, according to the species. When the

first or a new antler is about to be formed, the summits of these pedicles become tender, and bear small velvet-like knobs, which have a high temperature, and are supplied by an extra quantity of blood, which commences to deposit bony matter. This deposition of bony matter progresses very rapidly, and although in young deer and the adults of some species the resulting antler merely forms a simple spike, or a single fork, in full-grown individuals of the majority it assumes a more or less complexly branched structure. All this time the growing antler is invested with a skin clothed with exceedingly fine short hairs, and is most liberally supplied with blood-vessels; this sensitive skin being called the velvet. Towards the completion of its growth a more or less prominent ring of bone, termed the burr or coronet, is deposited at its base just above the junction with the pedicle; this ring tending to constrict the blood-vessels, and thus cut off the supply of blood from the antlers.

As some diversity of opinion exists with regard to the state of the antler after the cutting off of the supply of blood to the velvet, two somewhat opposing statements may be quoted. On page 431 of the article "Mammalia" in the *Encyclopædia Britannica* (9th edition) Sir W. H. Flower writes as follows:—"When the growth of the antler is complete, the supply of blood to it ceases, the skin dies and peels off, leaving the bone bare and insensible, and after a time, by a process of absorption near the base, it becomes detached from the skull and is shed. A more or less elongated portion, or pedicle, always remains on the skull, from the summit of which a new antler is developed."

On the other hand, Mr. A. Gordon Cameron, writing in the *Field* newspaper of 22nd August 1896, makes the following observations:—"A stag's antlers, though commonly described as horns, are not horns in the physiological sense of the word, but bones of similar texture to the flat bones of the skull, and developed by a similar process. Nor are they dead bones, though commonly described as such, but living bones composed of a hardened surface and a porous centre with blood circulating through it." And the same gentleman and other writers have adduced instances where the antlers of a deer have bled when sawn off above the pedicles. It is quite true that internally antlers display a honey-comb or cancellous structure; but the fact that in some instances the pedicles are formed of impermeable ivory-like bone, seems to preclude the possibility of there



FIG. 1. Group in one of the Paddocks at Woburn Abbey, including Pekin Sika, Red Deer, Caspian Red Deer, Chital, and Virginian Deer, together with Mouflon. From a photograph by the Duchess of Bedford.



FIG. 2. -A second group in the same Paddock, including Caspian Red Deer, Chital, and Virginian Deer. From a photograph by the Duchess of Bedford.

being any important supply of blood from the skull to the core of the antler ; and the description of antlers as dead bone seems therefore justified. On the other hand, I have seen recently sawn fallow deer antlers which bled freely from the interior.

When the antlers are freed from the velvet—a process usually assisted by the animal rubbing them against tree-stems or boughs—they have a more or less rugose surface, owing to the grooves formed in them by the nutrient blood-vessels. Although a few living species have the antlers in the form of simple spikes in the adult male, in the great majority of species they are more or less branched ; while in some, like the elk and fallow deer, they expand into broad palmated plates, with tines, or snags, on one or both margins. In the antlers of the red deer group, which form the type of the whole series, the following names have been applied to their different component parts and branches. The main shaft is termed the beam ; the first or lowest tine the brow-tine ; the second the bez-tine ; the third the trez-tine, or royal ; and the branched portion forming the summit the crown, or surroyals. But the antlers of all deer by no means conform to this type ; and in certain groups other names have to be adopted for the branches.

As already said, the antlers of young deer are in the form of simple spikes ; and this form is retained in the South American brockets, although, as shown later on, the simple antlers of these deer appear due to degeneration, and are not primitive types. Indeed, no living deer shows such primitive spike-like antlers in the adult, and it is doubtful whether such a type is displayed by any known extinct form, although many have a simple fork. And, on the whole, there is a regular evolution of complexity in the antlers of the deer as they are traced upwards from the middle portion of the Tertiary period towards the present and immediately antecedent epochs. In the deer of the sambar group, where the antlers never advance beyond a three-tined type, the shedding is frequently, if not invariably, very irregular ; but in the majority at least of the species with complex antlers the replacement is annual, the new appendages attaining their full development immediately before the pairing-season. In such species there is a more or less regular annual increase in the complexity of the antlers up to a certain period of life, after which they begin to degenerate, or “go back.” Of four well-fed red deer kept in captivity at Blair-Athole, the following

record of their antler-development is quoted by Mr. Gordon Cameron : —
“One of the stags continued to improve till he was nine years old, after which he remained stationary till fifteen, when he became diseased and was shot. Two of them went on improving till they were eleven years old, and then remained stationary till they were sixteen, when they became diseased and were shot ; the fourth went on improving till he was thirteen years old, when he was killed in a fight.”

Peculiarities in antlers are reproduced year after year in the same stag with remarkable regularity ; red deer or wapiti with badly formed brow-



FIG. 3. —Antler of Caspian Red Deer, from a Hungarian specimen in the collection of Viscount Powerscourt. Counting from the skull upwards, the first tine is the brow, the second the bez, and the third the trez, above which come the surroyals, or crown.

tines, or fallow deer with an extra tine, reproducing such singularities with extreme constancy. This, among many other more convincing reasons, indicates the importance of antlers as a basis of classification of the deer tribe. And although these appendages were to a certain extent put in the background by the late Sir Victor Brooke, Mr. A. Gordon Cameron seems to have successfully proved that they have the right to a very foremost place in the scheme of classification. As they are the most easily recognised feature in a deer's organisation, their adoption as a basis of

systematic classification largely simplifies the study of what is in many respects an exceedingly difficult group of animals.

With regard to the origin of antlers, it has already been mentioned that the earliest known deer were devoid of these appendages, and that when they first made their appearance they were of the simply forked type. In some at least of these primitive types the entire antler seems to have been very similar to the pedicle, from which it was not separated by a distinct burr, and the whole structure was probably covered permanently with skin, as are the horns of the giraffe at the present day. Such a skin-clothed structure would, however, obviously have been extremely exposed to injury; and the development of a burr led to the cutting off of the supply of blood from the portion above the ring, and the evolution of the antler in its present form. But such a structure is incapable of any reparation of an injury, and the next stage in the development was in all probability the periodical shedding and reproduction. As this reproduction in the species where the shedding is annual is, as already said, always completed at the commencement of the pairing-season, it is a natural inference that, at the present time at least, antlers are largely connected with the sexual function. And further evidence of this is afforded by their almost universal restriction to the males. It has indeed been very generally considered that stags with the largest antlers were those which succeeded in obtaining the leadership of the herd and the mastery of the females. But some years ago Mr. Caton remarked that among a herd of wapiti in captivity in Ottawa the mastership was held by a large stag with small antlers, while a smaller stag with much larger antlers was kept at a distance. And more recently Mr. A. Gordon Cameron has stated that among Scotch red deer antlerless or "bald" stags, though wielding no weapons and displaying no ornament, prove to be in all respects a match for their armed and theoretically more attractive rivals, so that they are usually master-stags, and sometimes acknowledged monarchs of large herds.

This is certainly very strong evidence against the theory that sexual selection can be regarded as sufficient to account for the origin and purpose of the frontal weapons of this group of ruminants. And in the opinion of the writer last quoted their original purpose was as weapons of offence against the attacks of beasts of prey; such weapons having at first been common to both sexes, but subsequently lost, as a normal feature, in the

females of all species of the deer tribe except the reindeer. As this subject is one which obviously admits of a large amount of argument, and as the object of the present volume is to record facts rather than to discuss theories, it must be dismissed with this brief mention.

Other Structural Features of Deer.—The general external appearance of deer is too well known to require any special mention, although it may be observed that when at rest they all carry the head well above the line of the back, that the ears are always well developed and frequently large, and that the tail never reaches below the hocks, is frequently very short, and may be practically wanting. Very generally the epithet “graceful” is applied to these animals collectively ; but although its application is perfectly justified in the case of such species as the Virginian and the fallow, it is certainly inapplicable to forms like the reindeer, the elk, and Thorold’s deer, the second of which is one of the most ungainly of all animals, while the third is decidedly a clumsily built creature. And, as a whole, it seems that in respect of general gracefulness of form and appearance the deer must give place to the antelopes and gazelles, although the size and beauty of their antlers will always render them a most attractive group. In point of bodily size there is every gradation between the maximum height, as exemplified by the elk ($6\frac{1}{2}$ feet), and the minimum, as represented by the Chilian pudu ($13\frac{1}{2}$ inches).

In respect to their coat and colour several interesting peculiarities are presented by the deer tribe. All are well clothed with hair, which is generally more or less coarse and stiff, although frequently finer in summer than in winter ; except in the reindeer, it has no resemblance to wool, and, save in that species, there is little or no true under-fur. In most, if not all, species two annual changes of the pelage take place, the one in spring and the other in early autumn. In the spring change the process may be either sudden or protracted ; and in the wapiti, while this change is rapid, the autumnal one is a slow process. Writing of this species, Mr. Caton says : “The winter coat is all detached so nearly together that if the hairs were dropped off so soon as they are loosened, the animal would appear almost naked, so short would be the new coat. But the inner coat of fur has during the winter become felted together, embracing and confining the long coarse hairs, so that they cover the animal as with a blanket, after considerable portions have become loosened, thus allowing the young

hairs to obtain some length before their predecessors are gone. Indeed, the old coat does not in fact drop off, as in ordinary cases, but is torn away in large patches, by contact with the shrubbery." A precisely similar process is observed in the shedding of the coat of the American bison. When the process of changing is a slow one, in many species the red coat of summer may be seen showing through the gray one of winter, or *vice versa*, giving to the animal a curiously mixed type of coloration. Not only is the summer coat generally finer than that of winter, but in many species the hairs themselves are different in structure, being thin, straight, and compact, instead of thick, waved, and more or less pithy. In the deer of temperate and cold climates the summer coat is frequently retained for a very short period, often not more than three months, or even less.

Judging from the number of species which are spotted, either permanently or during the period that they are in summer pelage, and likewise from the still more frequent occurrence of white spots in the pelage of the fawns, as well as from the circumstance that the young of so many other Ungulates are either spotted or striped with white, it may be inferred that spotting was the original type of coloration in all the members of the group. And as such spotting is generally associated with a ground-colour of some shade of tawny or reddish, it may further be inferred that the same tints characterised the ancestral forms. As a rule, those species which are permanently spotted, such as the Indian chital, show but little change of colour between the summer and winter coats; but in all the species which are spotted only in summer, and in many of those which are uniformly coloured at all seasons of the year, the summer coat retains the original fawn or reddish tint, whereas the winter pelage tends to some shade of gray or dark brown. In the former condition, as is well exemplified by the case of the Virginian deer, the animal is said by hunters to be in the red, and in the latter in the blue.

It is thus evident that in such species as show a marked difference between the colour of the summer and winter pelage, it is the red summer coat that retains the ancestral type of coloration, and that the gray or brown winter coat is an acquired character of comparatively late development. And it is obvious that those species, like the Japanese sika, in which the summer coat is spotted, are one stage nearer the original type than those, like the Virginian deer, in which the coloration is uniform at all seasons. A further

step in the development of what may be termed the modern or specialised type of coloration is presented by forms like the Malayan sambar, in which the colour of the pelage is some shade of uniform dark brown at all seasons, although spots are still retained by the fawns. And the culminating stage is presented by the Indian sambar and the elk, in which the coat is uniformly dark-coloured at all seasons and all ages. It is not a little remarkable that while this highly specialised type of coloration is presented by so many members of the sambar group, all retain antlers of a comparatively simple type.

The general darkness of coloration noticeable in the sambar group, which is as remarkable in the spotted Philippine deer as in the typical forms, appears to be an instance of that tendency towards blackness, either universal or individual, observable in many animals inhabiting moist and generally warm districts.¹ But, as exemplified by the case of the chital and swamp-deer, this melanistic tendency need not affect all the members of a group or family inhabiting the same or similar areas. Another example of the same tendency is well exemplified by the gradual darkening of the coloration of the forms allied to the Virginian deer as they approach the hot humid districts of tropical America, where this dark pelage is retained throughout the year. The dark coat of the elk is also developed in an animal essentially an inhabitant of humid, although colder, districts. What led to the permanent "melanism" of the dark-coated British variety of the fallow deer does not at present admit of determination.

In those species of deer presenting a marked difference between the coloration of the summer and the winter coat, there is not only a distinct change in this respect at the time of assumption of each pelage, but minor changes are going on almost continuously throughout the year. In consequence of this the same animal looks different almost every month, if not every week ; and the task of describing its true coloration becomes almost a matter of impossibility. Indeed, in such cases a coloured portrait of the animal is a true representation only for an extremely limited period ; and to obtain an adequate idea of the gradual changes the creature ought to stand for its portrait at least every fortnight. Fading of the colour of the hair, especially on certain portions of the body, seems to play an important part in such gradual changes ; the light-coloured patches on the rump of most members of the red deer group and of the roes exemplifying this fading.

¹ See a paper on "Melanism" by Dr. E. Lönnberg, published in the *Zool. Jahrbuch* for 1897.

These aforesaid light-coloured or white patches on the hind-quarters of many species, such as the members of the red deer group, the sikas, the fallow deer, and the roes during the winter, come under the category of recognition marks ; and are in all probability for the purpose of enabling the individuals of a herd to follow their leaders, when seeking safety from danger in flight, with as much ease as possible. The case of the roes, in which the white patch on the rump is fully developed in winter, but is quite wanting at the first assumption of the red summer pelage, is a very curious one, and one decidedly difficult of explanation. The does, however, drop their fawns about May, and at this time keep apart from the bucks. Now the fawns for a considerable period do not flee with the mother at the approach of danger, but are concealed by her in covert while she makes her escape alone. By the time the fawns are sufficiently grown to be able to flee from danger by the side of their dams, the white caudal patch is assumed, and the two sexes go about in company. These circumstances may afford an explanation of the disappearance of the white patch with the assumption of the summer coat. In the common sika the hairs of the caudal patch are capable of erection and expansion, thus increasing the size of the white area ; and the fallow deer, when alarmed, produces the same effect, by raising the tail. In the Virginian deer and its allies there is no such recognition mark when the animals are feeding ; but when starting off in alarm these deer elevate the tail, the white under surface of which, with the white on the inner sides of the buttocks, forms a most conspicuous lozenge-shaped recognition mark. Although such marks are most conspicuous in the groups mentioned, they occur to a more or less marked degree in many other members of the family, even the chestnut streaks on the buttocks of the Indian sambar coming under the same category. It will be obvious that these recognition markings, by rendering it more conspicuous to enemies, are a disadvantage to the individual, and that they are developed for the good of the species as a whole.

Colour-markings are, however, by no means the only aids with which deer are provided for the purpose of assisting them in finding the whereabouts of their companions. Of the "calling" or roaring of the adult stags during the pairing-season mention will be made in the sequel. The aids to recognition now to be referred to are glands. It has been stated that almost every species of deer is provided with a pair of glands situated

on the face immediately below the eyes. In some kinds, like the muntjacs and the Virginian deer, these glands are comparatively small, forming little more than folds in the skin, and having only very small and shallow depressions in the skull for their reception. In other kinds, however, and especially in the various races of sambar, they attain an enormous development, and rest in large and deep cavities in the bones of the skull. The upper surface, or lid, of such a gland is capable of complete eversion, leaving exposed the large cavity in the skull lined with glistening pink mucous membrane; and so peculiar is the appearance of the animals when the glands are thus opened, that the Chinese have conferred upon the Formosan race the designation of the four-eyed deer. As these glands are opened most fully and most frequently during the pairing-season by the stags, it is evident that they are largely connected with the sexual function. The muntjacs have also a single gland situated on the forehead, and hence termed the frontal gland.

In addition to these face-glands, most deer have interdigital or foot-glands, situated between the two main hoofs of each foot, and doubtless serving to leave a strong scent upon the ground over which their owner has passed. There may also be either one or two glands situated on each hind leg, the position of which is indicated by a tuft of hair longer than that clothing the rest of the limb, and frequently also differing more or less markedly in colour. The more commonly developed of these glands is situated on the outer surface of the lower segment of the hind limb above the foot, this segment being the one containing the cannon-bone, and technically known as the metatarsus. Hence the gland and tuft are spoken of as the metatarsal gland and tuft. In the red deer group this tuft forms a patch situated generally high up on the cannon-bone, and not differing markedly in colour from the hair of the rest of the leg. In the mule-deer it forms an extremely elongated strip extending along the greater part of the outer side of the cannon-bone, and of the same general coloration as the shorter hair adjacent. On the other hand, in the Virginian deer the gland forms a very small circular black patch near the lower extremity of the cannon-bone, surrounded by a conspicuous fringe of long white hairs. Not a little remarkable is the circumstance that in some smaller southern forms closely allied to the Virginian deer this gland is totally absent. In the sequel it is suggested that its presence or absence may

be dependent upon whether the animals live in herds or merely consort in pairs.

Less common is a gland situated on the inner surface of the hock, which is anatomically equivalent to the ankle, or tarsus, of other animals. Hence this gland and its tuft are termed the tarsal gland and tuft; its position being well shown in the coloured plate of the reindeer, where it stands out in conspicuous whiteness from the dark colour of the rest of the limb.

Lastly, the musks are peculiar in the possession by the males of a large glandular pouch situated on the abdomen, and secreting the substance from which these animals take their name.

As non-scientific persons frequently have very hazy ideas as to the nature and function of glands (which in truth are not fully known even to the scientific), the following extract on this subject, taken from Sir William Flower's above-mentioned article on the "Mammalia," may be quoted *in extenso*. "Most mammals," writes Sir William, "have special glands situated in modified portions of the integument, often involuted to form a shallow recess or a deep sac with a narrow opening, situated in various parts of the surface of the body, and secreting odorous substances, by the aid of which individuals appear to recognise one another, and probably affording the principal means by which wild animals are able to become aware of the presence of other members of the species, even at great distances. Although the commencement of the modifications of portions of the external covering for the formation of special secretions may be at present difficult to understand, the principle of natural selection will readily explain how such organs become fixed and gradually increase in development in any species, especially as there would probably be a corresponding modification and increased sensibility of the olfactory organs. Such individuals as by the intensity and peculiarity of their scent had greater power of attracting the opposite sex would certainly be those most likely to leave descendants to inherit, and in their turn propagate, the modification."

Classification.—Very different views as to the best way of classifying the members of the *Cervidæ* have obtained, and still obtain, among systematists; and the question, like others of a similar nature, depends largely upon the individual bias of the particular writer. To some minds a system appears to be more lucid when a number of divisions, based upon more or less trivial characters, are adopted; while to others greater clearness is obtained

when leading characteristics are alone taken as the ground of important divisions, and minor differences are reckoned of comparatively small moment. Neglecting earlier writers, three important syllabic classifications of the family have been published in comparatively modern times ; the first two of which followed the plan of making as many divisions as possible, while the third relegated a large number of such divisions to a much lower grade of importance. The first of these is one by the late Dr. J. E. Gray of the British Museum, which appeared in the *Scientific Proceedings* of the Zoological Society of London for the year 1850, and was expanded and otherwise modified in two Catalogues subsequently published by the British Museum. The second is that of the late Professor L. Fitzinger, which was published in the *Sitzungsberichte* of the Vienna Academy of Sciences at intervals ranging from 1873 to 1879. The third was written by the late Sir Victor Brooke, and appeared in the *Proceedings* of the London Zoological Society for 1878. Although it was published after the appearance of most of Fitzinger's memoir, the author does not appear to have seen the latter ; and hence while it professes to give a complete synonymy of the various genera and species, many names are omitted which ought to have appeared. It also contains a rather high average of serious errors ; and as it has been copied by nearly all subsequent writers, such errors have not only been perpetuated, but widely disseminated. Nevertheless, in spite of these deficiencies, the paper is one of a high order of merit ; and its general scheme of classification is the one followed in the present work, with such modifications and amendments as seemed necessary or advisable. In the case of genera, sub-genera, and species, numerous alterations in nomenclature have been rendered necessary by the revolution which has of late years taken place in this branch of zoological science ; and, in the opinion of advanced advocates for such changes, there are doubtless others that might have been made. The author is, however, a strict conservative in such matters, and very loath to insert changes in names now in current use.

The following table exhibits the generic and sub-generic groups into which the existing and some nearly allied extinct deer may be divided, with their leading distinctive characters :—

- A. SUB-FAMILY CERVINÆ.—Antlers, with one existing and some extinct exceptions, present in the male ; liver without a gall-bladder ; a face-gland and gland-pit.

- I. GENUS RANGIFER. Lateral metacarpal bones represented only by their lower extremities; antlers present in both sexes, complex. Northern part of Holarctic region.
- II. GENUS ALCES.—Lateral metacarpals as in preceding; antlers (as in the following genera) present only in the male, arising at right angles to the median longitudinal line of the skull, and extending at first in the plane of the forehead, after which they expand into a broad palmation margined with snags. Northern portion of Holarctic region.
- III. GENUS CERVUS.—Lateral metacarpals represented only by their upper ends. Antlers arising at acute angles to the median line of the skull (as in the following genera), at first projecting from the plane of the forehead, and then continued upwards nearly in that plane, supported on short pedicles, and furnished with a brow-tine, never regularly forked at first division, but generally of large size, and with not less than three tines; skull without ridges on the frontals forming the bases of the pedicles of the antlers. Upper canine teeth small, or wanting. Holarctic and Oriental regions.
 - i. *Sub-Genus Cervus*.—Antlers rounded, usually with five or more tines, generally including a bez (second), and always a trez (third); pelage of adult generally unspotted, with a large light-coloured disk surrounding the tail; young spotted. Holarctic region.
 - ii. *Sub-Genus Pseudaxis*.—Antlers smaller and simpler, four-tined, with a trez (third), but no bez (second); pelage of adult spotted, at least in summer, with a white area bordered by black in the region of the tail, which is also black and white. South-eastern portion of Eastern Holarctic region; Europe in Pliocene.
 - iii. *Sub-Genus Dama*.—Antlers without a bez, but with a trez-tine, above which the beam is more or less palmated, and generally furnished with numerous snags; pelage of adult spotted in summer, uniform in winter, with black and white markings in the region of the tail similar to those of *Pseudaxis*; young, spotted. South-western portion of Eastern Holarctic (Mediterranean) region, but more widely spread in Europe during the Pliocene epoch.
 - iv. *Sub-Genus Rusa*.—Antlers rounded, three-tined, with the bez- and trez-tines wanting, and the beam simply forked at the summit; pelage either uniform or spotted at all seasons. Oriental region.
 - v. *Sub-Genus Rucervus*.—Antlers flattened or rounded, without bez- or trez-tine, the beam dichotomously forking, and one or both branches again forked, so that the number of tines is at least four, brow-tine

forming a right angle or a continuous curve with the beam ; pelage of adult generally more or less uniform, of young spotted. Oriental region.

- IV. GENUS *CERVULUS*.—Lateral metacarpals as in *Cervus* ; antlers small, with a brow-tine and an unbranched beam, supported on long bony pedicles, continued downwards as convergent ridges on the forehead ; upper canines of male large and tusk-like. Oriental region.
- V. GENUS *ELAPHODUS*.—Nearly related to the last, but the antlers still smaller, with shorter pedicles and divergent frontal ridges ; upper canines of male not everted at the tips. South-eastern portion of Eastern Holarctic region.
- VI. GENUS *DREMOTHERIUM* (*Extinct*).—Lateral metacarpals in some cases complete, and in others apparently wanting ; antlers, when present, mounted on long bony pedicles, with a very imperfect burr, simply forked, and non-deciduous ; upper canines generally tusk-like ; cheek-teeth low-crowned (brachydont). Eastern Holarctic region, from the Oligocene to the Miocene periods.
- VII. GENUS *DICROCEROS* (*Extinct*).—Closely allied to the last, but with the antlers of a somewhat more advanced type, no tusk-like upper canines, and the cheek-teeth tall-crowned (hypsodont). Eastern Holarctic region during the Miocene period.
- VIII. GENUS *HYDRELAPHUS*.—Lateral metacarpals as in *Rangifer* ; antlers wanting ; upper canines of males tusk-like and growing from semi-persistent pulps ; cheek-teeth tall-crowned (hypsodont) ; tail moderate. South-eastern portion of the Eastern Holarctic region.
- IX. GENUS *CAPREOLUS*.—Lateral metacarpals as in *Rangifer* ; antlers rather small, without a brow-tine or sub-basal snag, dichotomously forked, with the upper or posterior prong again forking ; tail rudimentary ; vomer not dividing posterior nasal aperture of skull. Eastern Holarctic region.
- X. GENUS *ELAPHURUS*.—Lateral metacarpals as in *Cervus* ; antlers large, without a brow-tine or sub-basal snag, dichotomously forked, with the upper prong of the fork curving forwards and dividing, and the lower prong long, simple, and projected backwards, the beam making a very marked angle with the plane of the face ; tail very long ; vomer as in *Capreolus*. Eastern portion of Eastern Holarctic region.
- XI. GENUS *ANOGLOCHIS* (*Extinct*).—Lateral metacarpals unknown ; antlers large, without a brow-tine, but with a sub-basal snag, above which the beam is dichotomously forked, one or both prongs of the fork again dividing once or more, and the whole antler forming a marked angle with

Introductory

the plane of the face; vomer unknown. South-western portion of Eastern Holarctic region.

XII. GENUS MAZAMA.—Lateral metacarpals as in *Rangifer*; antlers very variable in size, forming a marked angle with the plane of the face, without a brow-tine; when consisting of more than a simple prong, dichotomously forked, frequently with a sub-basal snag, and always with the lower prong of the fork projected from the front edge of the beam, in some cases the lower, in others the upper, and in others both prongs again dividing; tail long; tarsal gland generally present; metatarsal gland very variable, both as regards presence and position; vomer dividing the inner aperture of the nostrils in the skull into two distinct chambers. Western Holarctic, Sonoran, and Neotropical regions.

- i. *Sub-Genus Dorcelaphus*.—Antlers large and complex, with a sub-basal snag, and the lower prong more or less developed at the expense of the upper one; metatarsal gland usually present; tail long or moderate, and hairy below; face very long and narrow; the face-gland small, and the gland-pit in the skull of moderate extent; no upper canines; size generally large. Western Holarctic, Sonoran, and northern portion of Neotropical region.
- ii. *Sub-Genus Blastoceros*.—Antlers large and complex, without a sub-basal snag, and the upper prong more developed than the lower one; metatarsal gland absent; tail short; face moderately long; face-gland and gland-pit well developed; upper canines usually present in male. Size large or rather small. Neotropical region.
- iii. *Sub-Genus Xenelaphus*.—Antlers small and simple, forming a single dichotomous fork; metatarsal gland absent; tail short; face moderately long; face-gland and gland-pit well developed; upper canines present in both sexes. Size medium. Western and southern portions of Neotropical region.
- iv. *Sub-Genus Mazama*.—Antlers in the form of simple unbranched spikes; metatarsal, and in one case also the tarsal, gland absent; tail very short; face elongated; face-gland small and gland-pit deep and triangular; hair of face radiating from two whorls; upper canines sometimes present in old male. Size small. Neotropical region.

XIII. GENUS PUDUA.—Skull and metacarpals generally as in *Mazama*; size very small; hair coarse and brittle; antlers in the form of short, simple spikes; cannon-bones very short; tail very short or wanting; no whorls in the hair of the face; face-gland moderately large, and gland-pit deep and

oval ; tarsal and metatarsal glands wanting ; ectocuneiform bone of tarsus united with the naviculo-cuboid. Neotropical region.

B. SUB-FAMILY MOSCHINÆ.—Antlers wanting in both sexes ; liver furnished with a gall-bladder ; no face-gland or gland-pit.

XIV. GENUS MOSCHUS.—Hair coarse and brittle ; upper canines of male very long ; no tarsal or metatarsal glands or tufts ; lateral metacarpals represented by their lower extremities ; lateral hoofs very large ; tail very short ; naked portion of muzzle extensive ; male with a large abdominal gland.

It will be seen from this table that the number of generic groups adopted is comparatively small, but that many of these are divided into sub-genera. The possession of one important common feature, such as the presence of a brow-tine to the antlers in the members of *Cervus*, and of the division of the hinder aperture of the nostrils in the skull of the American deer by the vertical plate of bone known as the vomer into two chambers, is regarded as entitling most or all of the forms in which it occurs to be included in one genus. Minor differences, on the other hand, constitute the basis of division into sub-generic groups.

Very similar considerations govern the grouping into species and sub-species, or races. For instance, when we have two members of a genus as distinct from one another as is the red deer from the wapiti, they are regarded as forming separate species. But the wapitis of Asia differ from the American forms, and if these were regarded as species, a distinction higher than specific would be required between the red deer and the wapiti. Consequently the Asiatic and American wapitis are regarded as sub-species, or races, of a single widely spread and variable species. In like manner, the various deer more or less nearly resembling the Indian sambar are classed as races of one species ; as are those akin to the Virginian deer of another. Should the system here adopted not be found acceptable to any students of the group, it can readily be modified into a more complex one. For instance, the *Cervinæ* and *Moschinæ* may be raised to the rank of families, when several of the generic groups will form the types of sub-families. The sub-genera will then stand as genera ; and the larger sub-genera, such as *Cervus* proper, will have to be divided into groups which will then possess sub-generic value. The red deer will then represent one sub-genus and the wapitis a second ; while the Asiatic and American forms of the latter will represent as many species.

Distribution.—In the study of any group of animals their distribution over the surface of the globe forms nowadays one of the most important factors. And distribution may be divided into two sections, namely, the present or geographical distribution, and the past or geological distribution. As regards the former of these, a few words are necessary to explain the divisions into which the world may be parcelled out from the distribution of mammals. First, there are three primary divisions respectively named the Notogaëic, Neogaëic, and Arctogaëic realms. The first of these, with which we have but little concern in this volume, includes New Zealand, Australia, New Guinea, New Ireland, New Caledonia, etc. The second contains the Neotropical region, which embraces the southern portion of Mexico, Central and South America, and the West Indies. The third, and by far the largest realm, consists of the rest of the world, and is divided into several regions. These include the Malagasy region, as represented by Madagascar and the Comoro Islands; the Ethiopian region, embracing Africa south of the Sahara; the Oriental region, containing India, Southern China, and the Malayan countries, the islands of Celebes and Timor, being, on the whole, best placed here, although their faunas show some affinities with that of Australia; the Holarctic region, embracing the greater part of Asia, Europe, North America, and Africa north of the Sahara; and the Sonoran region, which contains all the southern parts of North America not included in the Neotropical. The great Holarctic region may be divided into an eastern and a western division, the former embracing all the Old World countries constituting the region, and the latter such part of North America as comes within its limits. From the eastern division of the Holarctic some writers cut off Northern Africa and the other Mediterranean countries, together with those forming the northern boundary of the Oriental region, to constitute a separate Mediterranean region.

As regards the geographical distribution of the deer tribe, the most remarkable fact is their entire absence from the whole of the Ethiopian region. By far the greater number of generic and sub-generic types are confined to the Old World, which is likewise the habitat of the majority of the species. The occurrence of deer without antlers, and also of forms allied to the muntjacs in the Oligocene and Miocene Tertiary strata of Europe, and likewise of others possessing antlers of the sikine and perhaps the rusine

type in the Pliocene of the same area, points to the conclusion that the Old World was the original home of the types of deer by which it is now populated. And it may further be considered certain that the wapiti is a comparatively recent immigrant into North America by way of Bering Strait. Not improbably the elks are likewise immigrants into the New World from the Old, although generalised types occur in the later Tertiary deposits of both areas. With regard to the place of origin of the reindeer, there is no decisive evidence available. The most primitive of the brow-

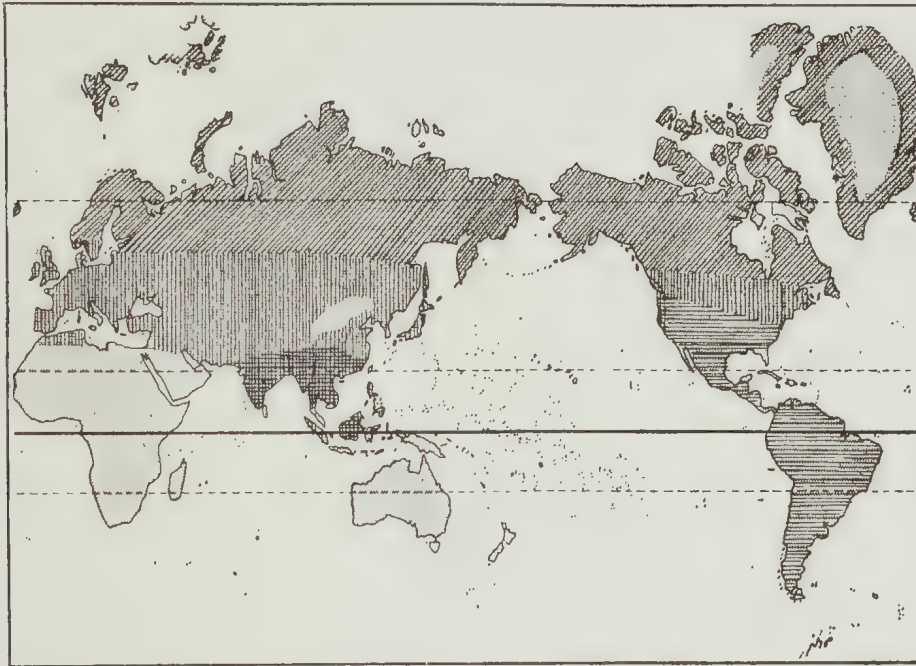


FIG. 4.—Diagrammatic Map of the distribution of Deer. The oblique shading indicates the approximate range of the Reindeer and Elk; the vertical that of the sub-genus *Cervus*, and in the Old World also of the Sikine and Damine groups, as well as of the Roes; the cross-shading that of the Rusine group and Muntjacs; and the horizontal that of the American Deer.

antlered Old World deer are undoubtedly the muntjacs, sambars, chital, and sikas, and there is proof that most or all of these existed in the European Tertiaries. Their existence in the Oriental region, and some adjacent parts of the Eastern Holarctic region, where species of the red deer group are wanting, is one out of many instances of the survival of ancient forms of life in these areas. That the fallow deer group is a specialised off-shoot from the sikas, may be asserted with considerable confidence; and the red deer group, characterised by the speciality of generally developing a bez-tine, may likewise be regarded as descended from the latter. Hence all

the brow-tined deer (*Cervus*, *Cervulus*, and *Elaphodus*), which agree in the retention of the upper extremities of the lateral metacarpal bones, are essentially Old World types.

Much more difficulty exists with regard to the relationship of the fork-antlered section, which includes the roes (to which the Chinese water-deer appears nearly related), the Asiatic milou deer, the extinct Old World genus *Anoglochis*, and the modern American deer. These present two distinct types of metacarpal structure, namely, one in which the upper ends of the lateral bones are retained, and another in which the lower ends remain; the condition existing in the extinct forms being unfortunately unknown. Assuming Mr. A. Gordon Cameron to be correct in regarding all the antlers of the forked type as indicative of a common ancestry, it is obvious that in such ancestors the lateral metacarpals must have been complete.

With regard to the roes, there is no definite information beyond the fact that they date from the earlier portion of the Pliocene epoch; but they are doubtless Old World types, and not improbably trace their ancestry to some of the extinct hornless muntjacs (*Dremotherium*), from which both types of antlers may have originated. Their metacarpal structure is the same as in the American deer. Nothing definite can be said with regard to the milou deer, in which the opposite type of metacarpal structure obtains, and the extinct *Anoglochis*, except that both are of Old World origin.

The American deer are usually regarded as the descendants of the two extinct North American genera *Blastomeryx* and *Cosoryx*, the former of which is regarded as the descendant of the extinct European *Dremotherium*.¹ Even on this view, the American deer are ultimately of Old World origin. But it is difficult to believe that antlers of such essentially similar general structure as are those of the modern American deer and the extinct European *Anoglochis* have originated independently; and there seems, therefore, to be a considerable probability that the American deer have taken origin from an Old World type allied to or identical with *Anoglochis*. The question is again discussed in the sequel, but it may be mentioned that *Cosoryx* is considered to be the ancestor of the American prong-buck (*Antilocapra*), and if this be correct, is it probable that it also gave rise to the American deer?

Before proceeding further, it may be well to mention that the geological formations of the Tertiary period, or those newer than the Chalk,

¹ See Scott and Osborn, *Bull. Mus. Harvard*, vol. xx. p. 76 *et seq.* (1890).

are divided, in descending order, into the Plistocene, Pliocene, Miocene, Oligocene, and Eocene epochs.

Whether they originated in the Old World or in North America, the American deer passed into South America in the early portion of the Pliocene epoch, when a land connection was first established *via* the Isthmus of Panama between the northern and southern halves of the New World, and a large number of animals belonging to an essentially northern type poured into South America, where they became mingled with the proper indigenous fauna of that region. In the earlier Tertiary formations of South America, which contain numerous fossilised remains of armadilloes, of the allied gigantic extinct glyptodonts, of ground-sloths, of American monkeys, and of various peculiar groups of Ungulates, those of deer are entirely wanting; whereas when we came to the Pliocene epoch the latter are abundant.

To revert to the Old World, great difficulty exists in giving any thoroughly satisfactory explanation of the entire absence of deer from Africa south of the Sahara, more especially as remains of species of an Oriental type occur in the later Tertiary deposits of India. Typical deer of the red deer group are, however, wanting in the Indian deposits, as they are in India at the present day, and as India seems to have been the great distributional feeder of Ethiopian Africa by way of Syria, it is easy to see why there are no members of that group south of the Sahara. With regard to the absence of Oriental types of deer in Ethiopian Africa, it is as difficult to discover any valid reason why these should have continued to flourish in the Oriental region since the Pliocene epoch without having entered Africa, as it is to explain why giraffes, hippopotami, and ostriches, which formerly inhabited the former area, should have completely disappeared from it to find a permanent home in the latter. The North African red deer of course effected an entrance into the north-western corner of Africa by means of a land-bridge connecting that area with Spain, as did likewise the fallow deer; the Sahara presenting an impassable barrier to their progress southwards.

Temperature seems doubtless to have been a factor of some considerable importance in the distribution of the various groups of the family. The members of the red deer group, for instance, have a general distributional area situated approximately between the fortieth and sixtieth parallels of north latitude, although passing somewhat to the north of this zone in

Norway, and south in North-Western Africa. The elk and reindeer, although impinging on the northern limit of the red deer group and in certain districts overlapping it, are characteristic of a colder zone, where *Rangifer* is practically circumpolar. On the other hand, the Oriental deer of the rusine and rucervine groups are essentially inhabitants of hot countries, and are abundant within the tropical zone. To a certain extent the sikas are intermediate in this respect between the rusas and the red deer, occupying to a large degree a zone between the two latter, but also intruding into the area of each. Their occurrence in the European Pliocene suggests, however, that comparatively warm regions formed their original habitat. The American deer range between latitude 40° north and the extreme south of the continent, and are accordingly able to stand excessive heat and a considerable amount of cold. Among these, the brockets are mainly restricted to hot climates, although one is found high up on the Cordillera; while the guemals are exclusively inhabitants of cold regions. The dorcelaphine section would seem to have been originally a temperate form, as the southern races allied to the Virginian deer are all small and apparently degraded types. On the other hand, from the present distribution of the marsh-deer and the number of allied extinct species in the Tertiary deposits of Northern Argentina, the blastocerine group appears to prefer a hot climate.

As already observed, remains of deer more or less closely allied to existing types are met with throughout the formations of the Plistocene and Pliocene epochs; some of those from the former, such as Sedgwick's deer and the Irish deer, attaining a development of antler unequalled by any living species. As we descend in the Pliocene the antlers tend to become smaller and simpler; and the distribution of the various groups is also found to differ considerably from that obtaining at the present day. When we reach the Miocene, all the deer are small, and their antlers never attain a development beyond that of a simple fork; while some of them were entirely devoid of these appendages. In the Upper Oligocene of America there are a few forms referred to the family in which the antlers, although simply forked, seem to have been clothed with skin and were permanently retained; but the Upper Oligocene deer of Europe were mostly devoid of antlers, and apparently furnished with long upper tusks, or canines, while the lateral metacarpal bones seem to have been complete. The earliest known form which can be in any way affiliated to the deer tribe is a small ruminant from the Middle

Oligocene marls of Ronzon, in the department of Puy-en-Velay, France, known as *Gelocus*. In this primitive little Ungulate the skull was devoid of either horns or antlers, and the hinder cheek-teeth had very short crowns, with low cusps and shallow depressions, but it is not improbable that upper incisor teeth had disappeared. The lateral metacarpals and metatarsals formed complete splints of bone, and in the hind limb the two median metatarsals had coalesced to form a cannon-bone, although the corresponding metacarpals remained distinct, as they do in the modern chevrotains. It has been suggested that in this extinct ruminant we have the ancestral type of both the chevrotains and the deer; and, in any case, it serves to show that as we recede in time we depart further and further away from the modern specialised types of the ruminant group.

Habits.—Since a considerable amount of space is devoted in the sequel to the habits of the individual species, a few observations will suffice on those of the group as a whole. Like most large family groups, the deer tribe is essentially an adaptive one, although in this respect it is decidedly inferior to the *Bovidae*, many members of which have established themselves in desert regions, where the *Cervidae* are almost entirely wanting. With the exception of such desert regions, deer have succeeded in establishing themselves in most districts of the countries into which they have been able to effect an entrance. Members of the family are found from the ice-bound shores of Greenland and the Arctic tundras of Siberia to the burning plains of Bengal and Brazil; while they are common to the dense grass-jungles and forests of India and the open pampas of Argentina; as they are to the latter and to the heights of the Andes and the upland forests of the Himalaya. Nevertheless, as a group, they are mainly inhabitants of forests or scrub-covered districts, especially where there are open tracts of grass near by on which they can graze; and many prefer the thin jungle on the borders of forests to the forests themselves. The near neighbourhood of water seems to be essential to the majority, if not indeed to all; and many, like the elk, Père David's deer, and the Chinese water-deer, delight to spend a considerable portion of their time in the water itself. The Virginian deer, too, may often be seen swimming from island to island in the American lakes.

While some kinds, such as the red deer, the fallow deer, the chital, and the sikas, congregate in larger or smaller herds led—at least during the breeding-season—by one or more of the older stags, others, like the elks,

muntjacs, roes, and musks, go about, either during the breeding-season or permanently, in pairs, or even singly. During the season of the renewal of the antlers the stags of the gregarious species, however, become solitary ; and in the case of woodland species are extremely careful of their movements. As the antlers mature and the velvet dries up, the animals become bolder. They at first select the stems of yielding saplings as rubbing-posts for removing the tattered remnants of the velvet, but in a few days endeavour to clean off the last remaining shreds by rubbing their antlers against the rugged bark of any tree that may be convenient.

Although in a wild state deer flee from man and their other enemies with the greatest precipitation, yet they have a strong spice of curiosity in their disposition, and may frequently be attracted within range by the sight of any moving object with the nature of which they are unacquainted, such as a cap or hat mounted on a pole and slowly waved about above a fence. This spirit of curiosity is much more strongly developed in the hinds than in the stags, the former being always the first to approach a strange object, as they are to come up to be fed in a park. The stags seem, indeed, to be largely dependent on the hinds as to their movements in all cases of doubt.

At the pairing-season the adult stags of all the larger species, as well as many of those of the smaller kinds, exchange their habitually peaceful disposition and become extremely pugnacious towards one another. Even this warlike disposition is, however, chiefly the result of mutual jealousy, for in a wild condition it appears to be only very rarely that they attack other creatures. With deer kept in confinement, even when their paddocks are very extensive, the case is very different ; and there are few more spiteful or more dangerous beasts than an old wapiti stag at such seasons. When in this condition the males of the larger species are by no means prepossessing in appearance. They stalk about with the face-glands everted, the head stretched out, and the blood-shot eyes rolling in a peculiarly wicked-looking manner ; the gait at the same time being curiously stiff and stilted, while at every obstacle to their progress the head is lowered and vicious sweeps are made with the antlers. Sometimes, apparently out of pure spitefulness, the antlers are thrust deep into a bank of sand or clay, and the broken soil tossed about in all directions. Often, too, they wallow in the mud and thus make themselves still more unsightly objects.

At the commencement of the pairing-season the old stags of the larger species commence calling, or roaring ; the cry differing very considerably even in closely allied species, or even races. In the case of the elk the cry of the stags is reciprocated by the hinds, although in a different key, and its object would therefore seem to be to bring the two sexes together. But in the case of the red deer and wapiti it seems to be a challenge from one male to another. When two adult stags meet in response to the challenge, they engage in a combat which lasts till one of the pair is completely vanquished, upon which the hinds, who have watched the conflict from a safe distance, put themselves under the escort of the victor. In the case of the smaller species the calling partakes more of the nature of a bark. Besides this periodical calling, most or all deer have a perfectly distinct alarm-cry, more or less resembling either a snort, a sneeze, or a whistle.

Many of the larger and more specialised deer are comparatively slow breeders, for although the hinds frequently, if not generally, breed annually, yet it is but seldom that more than a single fawn is produced at a birth, twins being rare, while triplets are practically unknown. The elk is, however, a marked exception in this respect, twins being far from uncommon, while triplets have often been recorded. The American deer, exclusive of the wapiti, are more rapid breeders, the Virginian deer often giving birth to a pair of fawns at a time. Muntjacs likewise frequently give birth to twins ; but the most prolific member of the whole family is the Chinese water-deer, which commonly produces four. As is the case with all ruminants, the fawns are produced in an advanced state of development, and very soon after birth are able to walk by the side of their parents. Naturally, however, some considerable time must elapse before they attain anything approaching the speed of the latter ; and during this period they are, in most cases, concealed on the approach of danger in thick covert by their dams, who then lose to a great extent their natural timidity, and display either great boldness in repelling foes, or cunning in attracting them away.

Like all other ruminants, deer are exclusively vegetable feeders, but, as a rule, they browse on leaves to a much greater extent than the *Bovidae*, although not to the same degree as the giraffe. The elk alone browses on the needles and twigs of coniferous trees ; but, in addition to this species,

several crop the leaves of water-lilies and other aquatic plants. Sambar and the chital do much damage to growing rice-crops, as do some of the South American brockets to plantations of cocoa and nutmeg. The reindeer alone subsists during winter more or less exclusively on lichens and moss, which it obtains by scraping away the covering of snow with its hoofs.

Economic Uses.—From a commercial and economical point of view deer are of more importance than is often considered the case. The uses of the reindeer to the Laps and other northern races are familiar to all; these animals affording meat, milk, and clothing, and likewise serving for draught and the carrying of burdens. The elk was also formerly trained to go in harness, and is then capable of performing long journeys at a high rate of speed. Antlers of various species are manufactured into the handles of knives, walking-sticks, and hunting-crops, and were formerly used as a source of ammonia; while they are still extensively employed as medicine by the Chinese. Much more important is the use of the skins of deer for leather, as will be apparent from the following figures taken from Mr. H. Poland's *Fur-bearing Animals*. It is there stated that from 80,000 to 100,000 skins of the American wapiti are annually imported for this purpose; of elk a few hundred Russian skins from time to time make their appearance in the London market, and in 1890 over 900 skins of this species were offered for sale. The pelts of Virginian and mule-deer are imported in large quantities into London, and again exported to Germany, where they are used in the manufacture of leggings for the Bavarian peasants, in one year no less than 227,000 skins being imported. The import of reindeer skins reaches several thousands annually, some of which are made into leather gloves. The trade in the antlers of this species is also very large, Denmark importing about 30,000 from Greenland and 8000 from Russia annually; they realise from about £13 to £14 per ton. A trade in reindeer tongues, which formerly attained considerable importance, seems to have almost ceased on account of the low prices obtained in England. Of chital skins no less than 53,922 were sold in London during 1891. These pelts make most excellent leather, and are now almost exclusively used for this purpose, their value varying from six to seven shillings each. A few are, however, worked up into foot-muffs and other articles by the London furriers. Of the antlers of this and perhaps other Indian species

no less than 424 tons weight were sold in London in 1891, the price ranging from £1 to £1 : 6s. per hundredweight. Fallow deer skins, known in the trade as buckskin, also afford a most excellent soft and pliable leather, but it is difficult to obtain accurate figures of the number sold. It is from this species that most of the venison sold in the London shops is obtained.



FIG. 5.—Head of Chital, from East Berar, in the possession of Lieut.-Colonel F. H. Whitby.
The antlers are the longest on record, measuring 38 inches along the curve.

PART II.—DESCRIPTIVE

A. THE TRUE DEER—SUB-FAMILY CERVINÆ

IN this section are included all the existing members of the family except the musks ; an essential feature being the absence of a gall-bladder to the liver. The brain, too, is characterised by the great development of the convolutions on its hemispheres ; and there are certain other peculiar features in the internal organs—especially those of the female—which aid in distinguishing between the two sub-families. A difference in the structure of the skull is noticed under the heading of the second sub-family.

With the exception of the existing Chinese water-deer and certain extinct forms, antlers are always developed in the male, and constitute one of the most convenient, and apparently also one of the most natural, means of dividing the members of the sub-family into generic and sub-generic groups. In his well-known synopsis of the deer, the late Sir Victor Brooke attributed but little or no classificatory value to these sexual appendages, but attached prime importance to the lateral (2nd and 5th of the typical series of five) metacarpal bones, which show two distinct types of ossification. In the one type, which is found in almost all the Old World deer, these bones are represented by their upper (proximal) extremities ; whereas in the other their lower (distal) ends are alone retained, and serve for the support of the bones of the lateral or spurious hoofs. To this type belong all the New World deer with the exception of the wapiti. Impressed with the importance of this distinction, Sir Victor divided the deer into the two sections *Telemetacarpi* and *Plesiometacarpi* ; the former including the genera *Rangifer*, *Alces*, *Hydrelaphus*, *Capreolus*, *Mazama*, and *Pudua*, and the latter all the rest. This classification has, however, the disadvantage of sundering from the American deer such a species as Père David's deer, which resembles the former in having antlers of a forked type without a brow-tine.

This and other objections to Sir Victor Brooke's classification have attracted the attention of Mr. Allan Gordon Cameron, who, in an important paper communicated to the *Field* newspaper,¹ has strongly urged the importance of the antlers as a primary means of classification, and has called attention to the essential difference between the "brow-tined" and the "forked" types of antler. And as both these types are of very considerable antiquity, dating from ages long antecedent to the present epoch, it does appear that antlers should be accorded much higher value in classification than many writers are disposed to assign to them. Moreover, in the case of the majority of extinct species reliance has to be placed almost or quite exclusively on the characters of these appendages; and it is only by taking them as the basis that it is possible to bring the living and extinct forms into line. There are many instances among animals where two distinct characteristics, if taken as bases of classification, afford dissimilar results; and as in the present case the antlers appear to be of decidedly more importance than the lateral metacarpals, the divisions proposed by Sir Victor Brooke are superseded by those advanced by Mr. Gordon Cameron.

I. REINDEER—GENUS RANGIFER

Rangifer, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 304 (1827), as a sub-genus; Brooke, *Proc. Zool. Soc.* 1878, p. 927; Rüttimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 51 (1881).

Tarandus, Ogilby, *Proc. Zool. Soc.* 1836, p. 134; Gray, *Proc. Zool. Soc.* 1850, p. 224, *Ann. Mag. Nat. Hist.* ser. 2, vol. ix. p. 416 (1852), *Cat. Ungulata Brit. Mus.* p. 189 (1852); Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 349 (1873), lxix. part i. p. 534 (1874).

Characters.—Lateral metacarpal bones represented only by their lower (distal) extremities. Antlers present in both sexes, complex, situated close to the occipital ridge of the skull, and thus far away from the sockets of the eyes (orbits), with the brow-tines of adult males palmated, laterally compressed, deflected towards the middle line of the face, and often unsymmetrically developed. Above the brow-tine is developed a second palmated tine, which appears to represent the bez; there is no trez, but some distance above the bez the beam is suddenly bent forwards to form an "elbow," on the posterior side of which is usually a short back-tine; above

¹ See Appendix.

the back-tine the beam is continued for some distance to terminate in a large palmation. Antlers of female simpler and generally smaller. Muzzle entirely hairy ; ears and tail short ; throat maned. Pelage unspotted at all ages, with a whitish area in the region of the tail, which includes its sides, but not its upper surface. Main hoofs short and rounded, lateral hoofs very large. A tarsal, but no metatarsal gland and tuft. In the skull the gland-pit shallow, and the vacuity of moderate size ; nasal bones well developed, and much expanded at the upper end. Upper canines wanting ; cheek-



FIG. 6.—Antlers of Male Woodland Reindeer. From a specimen in the British Museum.
(Rowland Ward, *Records of Big Game*.)

teeth small and low-crowned, with the third lobe of the last in the lower jaw minute. Bodily size large.

That reindeer are very different from other *Cervidæ* is apparent not only from the presence of antlers in both sexes, but likewise from their peculiar form and backward situation on the skull. With regard to whether the possession of these appendages is a primitive or an acquired feature, more evidence than is at present available seems necessary. Especially is this the case with regard to the ancestry of the group, which is totally unknown, fossil reindeer remains not antedating the Plistocene, and then being indistinguishable from those of the living European form. Mr. Gordon Cameron writes as follows on the question :—“ Since there is every reason to believe

that the possession of defensive weapons, whether cranial or dental, by both sexes was a primitive character, we have no difficulty in fixing limitation to sex as the first point of divergence in the history of the antlered deer. We conclude, further, that *Rangifer* represents the oldest line of existing deer with antlers, and the conclusion may be pressed home with the facts noted by Darwin relative to the time of life at which the antlers first appear. In seven species, of which the males alone carried antlers, belonging to distinct sections of the family, and inhabiting different regions, these appendages were found to develop at periods varying from nine months after birth in the roebuck, to ten, twelve, or even more months in the stags of the six other and larger species. In the case of the reindeer, Professor Nilsson found that the antlers appeared in the young animals within four or five weeks after birth, and at the same time in both sexes, so that we have here a structure developed at an unusually early age in one species of the family, and likewise common to both sexes in this one species only." A fawn born at Woburn Abbey also showed antlers in a few weeks.

Against the view that reindeer are a primitive type may be urged the loss of the spotted coat in the young, which is evidently a specialised feature, although one which may possibly be of late acquisition. The absence of remains of reindeer from formations older than the Plistocene period has been already mentioned. With regard to the argument from the presence of antlers in both sexes, it is rather difficult to see on what foundation this rests. In the Pliocene and Miocene cervine genus *Dremotherium* some individuals were provided with antlers which were lacking in others, and it has yet to be demonstrated that these latter are not the females of the former. Again, in the *Bovidæ*, or hollow-horned ruminants, it is mostly in the specialised and modern forms that the females, if horned at all, carry large horns. For instance, in the modern oxen the females have these appendages very largely developed, whereas in some of the Pliocene species of the genus this sex was hornless. On the other hand, in the kudu (*Strepsiceros*), horned antelopes (*Tragelaphus*), and elands (*Orias*), in which the cheek-teeth are of a low-crowned primitive type, it is only in the last-named genus that the females are normally horned. Again, in the gazelles and their allies, which are known to be an ancient group dating as far back as the Miocene period, it is generally only the males that are horned.

Although they present an enormous amount of racial and individual

variation, yet, as Mr. Caton observes, the antlers of reindeer “possess features never to be mistaken by the careful observer, who will at once recognise the caribou’s antler, no matter what its form.” In some types the beam is long and rounded and the palmation slight, while in others the former is short and flattened, and the latter greatly developed. Then, again, whereas in some antlers the back-tine is placed far above the level of the bez, and the terminal expansion separated by a long interval from the back-tine, in others the bez is very much expanded, and situated high up on the short beam, only just below the line of the back-tine, so as to form a dichotomous fork with the other half of the beam. Asymmetry is likewise a very frequent feature. In a Norwegian reindeer in the British Museum with a simple brow-tine on one side, the corresponding tine of the opposite side is wanting. In the American woodland reindeer, one brow-tine, generally the left, is enormously palmated, while the other forms a simple prong.

A magnificent series of reindeer antlers is preserved in the British Museum, but, unfortunately, in a large proportion of these the locality is not recorded, in many cases there being no evidence even as to the hemisphere from which they were obtained. Consequently it is no easy matter in this country to obtain a good idea of the characters distinguishing the antlers of the various geographical sub-species. On account of the different curvatures of the beam, reindeer antlers are extremely difficult to measure accurately; the following measurements of some fine examples are taken from Mr. Rowland Ward’s work, but in several cases the locality is unknown:—

Extreme Length.	Circumference.	Maximum Span.	Locality.
62	$5\frac{1}{2}$	$49\frac{1}{4}$	Canada
60	$5\frac{3}{8}$	$41\frac{1}{8}$?
$59\frac{1}{2}$	7	44	?
$57\frac{5}{8}$	$5\frac{1}{4}$?	Arctic regions
$57\frac{1}{4}$	$5\frac{1}{4}$	$44\frac{1}{2}$	”
$54\frac{3}{8}$	$4\frac{7}{8}$?	North America
54	$6\frac{3}{4}$	$32\frac{3}{4}$?
54	5	$41\frac{3}{4}$	Norway
$50\frac{3}{8}$	$4\frac{7}{8}$	29	?
49	$4\frac{1}{8}$	$32\frac{3}{8}$?
48	$6\frac{1}{2}$	$25\frac{1}{2}$	Newfoundland
$47\frac{3}{8}$	$5\frac{1}{8}$?	North America
47	$4\frac{5}{8}$	29	Norway

Distribution.—The northern portion of the Holarctic region, but descending much farther south (as far as France) in the Plistocene epoch than at the present day. Whether reindeer are ancient or modern inhabitants of the Arctic regions is a moot point. And whereas some writers consider that they are comparatively recent immigrants, Dr. Scharff¹ is of opinion that their original home is in the north, whence they wandered southwards. In the absence of decisive evidence in support of one or the other view, it may be pointed out that if these deer are considered to have originated in the north, it presupposes the existence of some earlier unknown member of the family in those regions, and of this we have no present cognisance.

THE REINDEER, OR CARIBOU—RANGIFER TARANDUS

Cervus tarandus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 93 (1766) ; Caton, *Antelope and Deer of America*, p. 86 (1877) ; Nehring, *Tundren und Steppen*, p. 108 (1890).

Cervus guettardi, Desmarest, *Mammalogie*, vol. ii. p. 447 (1822).

Cervus (Rangifer) tarandus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 83, v. p. 304 (1827).

Cervus tarandus schottini, Sternberg, *Isis*, 1828, p. 482.

Tarandus rangifer, Ogilby, *Proc. Zool. Soc.* 1836, p. 134 ; Gray, *Cat. Ungulata Brit. Mus.* p. 189 (1852), *Cat. Ruminants Brit. Mus.* p. 66 (1872) ; Fitzinger, *SB. Ak. Wien*, vol. lxi. part i. p. 534 (1874).

Rangifer tarandus, Gray, *List Mamm. Brit. Mus.* p. 181 (1843) ; Brooke, *Proc. Zool. Soc.* 1878, p. 928 ; Ward, *Records of Big Game*, p. 47 (1896) ; Scharff, *Proc. Irish Acad.* ser. 3, vol. iv. p. 473 (1897).

Characters.—In spite of the existence of more or less well-marked geographical races, reindeer from all parts of the northern hemisphere present such a marked similarity in general appearance that it seems preferable to regard them as all belonging to a single wide-spread species, of which most of the characters will be the same as those of the genus. The pelage is remarkable for its density and compactness ; the general colour of the head and upper-parts being clove-brown, with more or less white or whitish gray on the under-parts and inner surfaces of the limbs, while there is also more or less white above the hoofs and on the muzzle, and

¹ *Proc. Irish Acad.* ser. 3, vol. iv. p. 473 (1897).

there may be whitish rings round the eyes ; there is a white area in the region of the tail, which includes the sides but not the upper surface of the latter ; and the tarsal tuft is generally white. The antlers are smooth, and brownish white in colour, but the hoofs are jet black. Albino varieties occasionally occur in the wild state. A height of 4 feet 10 inches at the shoulder has been recorded in the Newfoundland race.

Distribution.—The same as that of the genus.

a. SCANDINAVIAN RACE—RANGIFER TARANDUS TYPICUS

Plate I

The wild Scandinavian reindeer, which may doubtless be regarded as the typical form of the species, is a smaller animal than the American woodland race, with antlers approximating to those of the barren-ground race, but less elongated, and with a distinct back-tine in the male, the brow-tines moderately palmated and frequently nearly symmetrical, and the bez not excessively expanded. Female antlers generally much smaller than those of the male, although occasionally as large, but with much fewer points. Pasterns of feet very short and broad, without any distinct cleft between the two component phalangeal bones of each segment, and a tuft of hair immediately above the cleft of the hoof. Tail very short. Tarsal tuft very long. The white ring above the hoofs passing imperceptibly into the fawn of the limbs without any distinctly marked line of division in the male, and, in some cases at least, almost absent in the female. A distinct light ring round the eye in the male, but not in the female. Upper surface of tail but little darker than the sides and under surface. Some white on the muzzle.

The above description is taken from a mounted male and female from Norway in the British Museum, supplemented by Dr. J. A. Allen's notes. Seen side by side with the male woodland reindeer mounted in the same case, they confirm the latter writer's statement that the Scandinavian reindeer has the appearance of being quite a different animal from either of the New World races. Most marked is the difference in the conformation of the feet, although other specimens are required to show how far this is constant. In their shortness and expansion, the feet of the European reindeer seem more adapted for marshy districts than are those of the American



SCANDINAVIAN REINDEER.

NATIONAL YOUTH FOUNDATION

forms. In the female specimen referred to above, the antlers are as large as those of the male, but simpler and without the back-tine, but in other Norwegian examples they are much smaller.

Distribution.—The Scandinavian reindeer inhabits a large part of Norway, Sweden, and Lapland, and extends into Russia, although its eastern limits in Asia cannot yet be ascertained. In the Ural district the southern limits are about the 52nd parallel of latitude in the Kirghiz Steppes, but in Kazan reindeer are not known south of latitude 54°. The domestic race has been introduced into Iceland. In the extreme north, reindeer, although unknown in Franz Josef Land, are found at Cape Chelyuskin, and also in Novaia Zemlia, Spitzbergen, and Phipps and Parry Islands, lying between the 80th and 81st parallels. I have, however, no means of knowing to what race these belong. Even in the historic period the southern range of the reindeer seems to have been more extensive than at present, as these animals are stated to have existed in the Black Forest during Cæsar's time, although their alleged occurrence in Caithness is probably incorrect. Be this as it may, there is abundant evidence of the existence of reindeer in Britain during the Plistocene epoch, and they even extended as far south as the valleys of the Dordogne and Garonne in France. In the memoir already cited, Dr. Scharff states that two races of reindeer, the one representing the American barren-ground and the other the woodland type, are met with in Europe, while only the latter occurs in Asia. And he proceeds to draw the inference that while the woodland type reached Asia by way of Bering Strait, the barren-ground race has migrated by way of Greenland, and that this race alone reached Ireland. With regard to the occurrence of the woodland form in Eastern Asia, I agree with the author, but I cannot see that the Scandinavian reindeer can be identified with the barren-ground race, neither can I find evidence of the existence of the woodland type in Europe at the present day, whatever may have been the case in past epochs. Whether the wild Kazan reindeer are the same as the Scandinavian, may perhaps be doubtful. Eversmann¹ states that the females of the former are generally without antlers, and that the males are considerably larger than those from Norway and Lapland.

Habits.—In treating of the habits of the Scandinavian reindeer, those

¹ *Bull. Soc. Moscou*, 1840, p. 58.

of the other Old World races may be included, as they appear to be very similar. In Norway, wild reindeer inhabit the high fjelds, where almost the only other inhabitants are the ptarmigan and the black and yellow lemming. These high plateaus contain numerous hollows in which snow remains throughout the summer, and on these snow-beds the reindeer are fond of lying, so that in stalking a telescope is frequently of little use in discovering the whereabouts of a herd. Although essentially gregarious animals, it appears from the account given by Mr. E. N. Buxton¹ that during the summer the herds on the high fjelds of Norway comprise nearly 95 per cent of females, and it is suggested that this may be due to the males having thicker hides, and thus being less tormented by mosquitoes, so that they are able to remain in the valleys below, where the food is richer. The same writer was also told that the hinds carry their antlers for some months after those of the bucks are shed, and during this time are able to keep their lords and masters in complete subjection. At the present day the numbers of the wild Norwegian reindeer are greatly reduced. But it appears from Mr. J. Lloyd's *Scandinavian Adventures* that in the early part of the century these animals were as abundant as blesbok in Africa. In that work it is stated that one day in June 1826 the fjeld, for a breadth of seven miles, was covered with reindeer as thickly as an English field by sheep when feeding; the herd extending so far that the eye could not embrace the whole at once. Subsequently this immense herd broke up into three divisions.

In Spitzbergen, according to the narrative of Baron Nordenskiöld, the wild reindeer resort in summer to the grassy plains in the valleys free from ice; late in the autumn they are reported to descend to the coast, where they pick up a subsistence on the sea-weed thrown by the waves on the beach, but in winter they once more return to the inland heights, where, in spite of the intense cold, they thrive well on the reindeer-moss, or lichen, growing beneath the snow. Indeed, when they return to the coast in spring they are in excellent condition, but shortly afterwards, when the melting snow cakes into ice on the mountain-sides, they are much put to it to find food, and consequently become very thin. With the return of summer they speedily recover, and by the end of autumn are quite fat. Even in such a remote district as Spitzbergen the numbers of these animals have

¹ *Short Stalks*, p. 330 (1892).

been greatly diminished, and in the north-western districts they have been completely extirpated, although they are numerous in Ice-Fjord. Whether the stock on this comparatively small island is from time to time replenished by immigration across the ice from some unknown land to the north-east, is not definitely known, although it is suggested that such may be the case.

Apparently in all the continental parts of their habitat reindeer undertake periodical migrations, and in Eastern Siberia herds numbering thousands of individuals have been observed descending from the northern hills and crossing the open plains to reach the forests where they pass the winter. Such herds split up into minor parties, which move slowly and regularly, and are led by an old deer of large size. One reason that these animals migrate to high grounds in summer is to escape the attacks of mosquitoes and gad-flies, by which they are much tormented in the valleys, their skins being sometimes full of bots. The breeding habits appear similar to those of the American races. Reindeer have been tried at Woburn Abbey, but with no success, as they always die after a comparatively short sojourn. This and other instances may be taken as a convincing proof that the climate of England has undergone very considerable alteration since the time when the country was inhabited by these animals.

b. SPITZBERGEN RACE—RANGIFER TARANDUS SPETZBERGENSIS

Cervus tarandus spetzbergensis, Andersen, *Öfvers. Vet. Ak. Forhandl.* 1862, p. 457; Nitsche, *Jahresb. Ver. Nat. Württ.* 1893, p. 111.

Characters.—This form is described as differing very markedly from both the Scandinavian and Greenland races, but there are no mounted examples in English collections. The most marked characteristic appears to be afforded by the nasal bones of the skull, as figured by Dr. Nitsche. In the Scandinavian reindeer these bones increase regularly in width from the lower end to the maximum diameter on the line of the lachrymal vacuities, but in the Spitzbergen form they are much expanded at both extremities and deeply constricted in the middle, and there is also a decided difference in the form of their superior border. The same type of nasal bones is exhibited in a male skull in the British Museum purchased in Spitzbergen by Dr. J. W. Gregory; and I am informed by Mr. Trevor-Battye that the same feature is constant in all the specimens that have come under his

notice. In the British Museum skull the antlers approximate to the Scandinavian type, although they are smaller and the beam is relatively shorter ; both the brow- and bez-tines are expanded, the right brow being much larger than the left. In the two skulls figured by Dr. Nitsche the antlers are simple, and are probably either immature or those of females. The whole animal is inferior in size to the Scandinavian reindeer.

Distribution. —Spitzbergen.

c. WOODLAND RACE—RANGIFER TARANDUS CARIBOU

Cervus tarandus caribou, Gmelin, *Syst. Nat.* vol. i. p. 177 (1788).

Cervus hastalis, Agassiz, *Silliman's Journal*, 1847, p. 436.

Cervus tarandus sylvestris, Richardson, *Fauna Bor. Amer.* p. 251 (1829).

Rangifer caribou, Audubon and Bachman, *Quadr. N. Amer.* vol. iii. p. 111 (1853) ; Baird, *N. Amer. Mamm.* p. 633 (1857) ; J. A. Allen, *Bull. Amer. Mus.* vol. viii. p. 234 (1896) ; Miller, *P. Boston Soc.* vol. xxviii. p. 40 (1897).

Tarandus hastalis, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 349 (1873), lxix. part i. p. 542 (1874).

Characters.—This form is the one commonly known in America as the woodland caribou, and is of large size, with the antlers stout, flattened, much palmated, and not of excessive length ; one of the brow-tines being much expanded, while the other is simple ; the bez-tine being also more palmated than in the Scandinavian form, and the back-tine well developed. Female antlers are proportionately smaller than in the Scandinavian race. From the evidence of a mounted specimen in the British Museum obtained from Hudson Bay, and Dr. Allen's notes (which are based on three examples from New Brunswick in the autumn pelage), the following features seem distinctive of this form, especially as compared with the Newfoundland race. The pasterns of both fore and hind feet are very long and slender, with the cleft of the hoofs continued upwards on the front line as far as the lower end of the cannon-bone, and there is no distinct tuft of hair above the cleft of the hoof. The colour of the body and limbs is much darker than in the Newfoundland race, the dark area extending over the anterior half of the lower surface of the body ; and, except the extremity of the upper lip, the muzzle is as dark as the face, while there is no light

ring round the eye. On the limbs the white is restricted to a sharply-defined band of about half an inch in width just above the hoofs, but ascending behind to enclose the lateral hoofs. In the British Museum example the tarsal tufts are much less conspicuous than in the Scandinavian reindeer; and the muzzle has rather more white than Dr. Allen describes.

Regarding the variations in colour displayed by the woodland race, Mr. Caton writes that while the head and legs "are always distinctly coloured, in a large majority of individuals white predominates, especially on the neck, which is almost universally the whitest portion of the animal. The long white mane of the old buck is a very striking characteristic. . . . There is less uniformity in the colour of the body than of the head, neck, and legs. While the head and legs are tawny brown of varying intensity, and the neck white, in some much more pronounced than in others, the body is sometimes nearly all white; but others are a rich rufous brown on the back as well as the legs, and only the tail and rump are white above, the belly and inside of the legs being also white. Like all the others, the early winter coat, which replaces the summer coat in September, is of the deepest colour, is finer, softer, and more brilliant than later, when the clove-brown shade which first prevailed has given place to the dirty white of mid-winter."



FIG. 7.—Side view of Skull and Antlers of Male Woodland Reindeer. From a Nova Scotian specimen in the British Museum.

A fine pair of antlers from Siberia in the British Museum show all the characteristics of the American form, and lead to the conclusion that the range of the latter extends into Eastern Asia. If the Siberian form prove distinct, it will apparently require a new sub-specific name, as it cannot be identified with the Scandinavian race. The antlers from Nova Scotia represented in Fig. 7 exhibit the extreme development of the woodland race, approximating in their massiveness to the Newfoundland race, but have

fewer points on the upper surface of the extremity of the beam than usual ; those shown in Fig. 6 are more elongated, and have more points.

Distribution.—Upper North America as far north as the limits of forests, but the boundary varying somewhat owing to seasonal migrations ; and apparently North-Eastern Asia as far as Siberia. In America the range includes Labrador and Northern Canada, and thence south to Nova Scotia, New Brunswick, Northern Maine, and Lower Canada on both sides of the river St. Lawrence, whence it passes westwards through the districts north of Quebec to the neighbourhood of Lake Superior, to the south of which reindeer are unknown. It is curious that Mr. Caton identified this form with the typical Scandinavian reindeer, although the latter appears to be more nearly related to the American barren-ground race.

Habits.—Although its habits are doubtless essentially the same as those of the Scandinavian reindeer, yet the woodland race has certain distinctive ways of its own, which serve to differentiate it from the barren-ground reindeer. In the first place, it is essentially a forest-dwelling animal, and to this may be due the comparative shortness and thickness of its antlers. In the second place, while the woodland race generally associates in small parties of not more than a dozen head, the barren-ground form collects in herds numbering thousands of individuals. The Newfoundland race is, however, somewhat intermediate between the other two in this respect, as it collects in considerably larger droves than its woodland relative of the continent. More important are the differences in the migratory habits of the two, the woodland race travelling northwards and the barren-ground southwards in the autumn. On this subject Sir John Richardson wrote as follows :—“ Contrary to the practice of the barren-ground caribou, the woodland variety travels to the southward in the spring. They cross the Nelson and Severn rivers in numerous herds in the month of May, and pass the summer on the low marshy shores of James Bay, and return to the northward, and at the same time retire more inland in the month of September.” Commenting on this passage, Mr. Caton has the following observations :—“ Here, then, we find the woodland caribou migrating to the northward, on the west coast of Hudson Bay, and west of it as high as 55° to 57° of north latitude, or within one degree of Churchill, which is near the southern limit of the range of the barren-ground caribou in that longitude as given by Richardson, though I have authentic evidence that

they sometimes come considerably farther south in exceptional seasons." After stating that they have been known to wander as far south as Lake Huron, in about lat. 47°, he concludes that the two forms must not unfrequently meet in the breeding-season, and yet there is no evidence that they ever cross. Assuming its correctness, this statement is very remarkable, bearing in mind that such totally distinct forms as the red deer, wapiti, and Japanese sika will readily interbreed.

Writing of the woodland reindeer, Mr. Caton observes that it "is fond of arboreous food, grasses, and aquatic plants, but its great resource is lichens. It frequents marshy and swampy grounds more than any other of the deer family, for which it is admirably adapted, and where it is well protected from pursuit. In the winter it resorts to the dense forests on high ground. The breeding-season is in September, and the fawns, which may be one or two in number, are born in the following May. The males shed their antlers in December, although those of the does remain till the spring." Mr. Caton describes the woodland reindeer as an exceedingly wild and restless animal, of a highly wary and suspicious nature, and one much given to constant change of feeding-grounds. An alarm from which a wapiti will be caused to flee but a few miles, will drive a caribou clean out of the country. Hence the animal does not promise well for domestication; and, as a matter of fact, no thorough attempt seems to have been made to domesticate either of the American races, although tame reindeer from Lapland have been imported into Alaska. In summer these reindeer graze on the rich grass of the valleys, keeping quite clear of the thickets.

d. NEWFOUNDLAND RACE—*RANGIFER TARANDUS TERRÆ-NOVÆ*

Rangifer terræ-novæ, Bangs, *Description of Newfoundland Caribou*, Boston, 1896; J. A. Allen, *Bull. Amer. Mus.* vol. viii. p. 233 (1896).

Rangifer tarandus terræ-novæ, J. A. Allen, MS., see *op. cit.* p. 235.

Characters.—Dr. J. A. Allen, by whom this sub-species has been described, gives the following characteristics as distinctive. The bodily size is large, and the antlers are very massive and much palmated, with numerous points on all the branches and especially on the hinder border of the beam. The adult male in the autumn pelage has the following coloration: upper-parts grayish brown, becoming lighter on the flanks, and

passing into nearly pure white on the under surface of the body ; neck dirty white, somewhat purer in front ; a broad, ill-defined light ring round the eye, and the entire muzzle and lower portion of the face, as well as the extremity of the lower jaw, grayish white ; rest of head like the back ; edges and lower surface of tail and buttocks white ; front and outer surface



FIG. 8. Head of Male Newfoundland Reindeer. From Dr. J. A. Allen, *Bull. Amer. Mus.* vol. viii. (1896).

of limbs brownish gray ; feet and terminal third of the metacarpal and metatarsal segments white, passing gradually into the general colour of the limbs above. The female shows rather less white ; and the young is still darker, with a dusky line on the flanks, and a blackish streak running down the back and expanding over the shoulders.

By previous writers the Newfoundland reindeer has been considered identical with the mainland race. Indeed, after stating that it is found in

numbers on the island, Mr. Caton mentions that it is reported frequently to cross on the ice to the continent. If this be true, the right to sub-specific distinction would be more than doubtful. The chief claims to distinction appear to be the generally lighter colour, the much greater extent of white on the feet and muzzle, the light rings round the eyes, and the shorter and more massive antlers. From a series of specimens that I have lately seen, the characters of the present form appear to be very constant.

Distribution.—Newfoundland.

e. GREENLAND RACE—RANGIFER TARANDUS GRÆNLANDICUS

Cervus tarandus grænländicus, Gmelin, *Syst. Nat.* vol. i. p. 177 (1788).

Rangifer grænländicus, Baird, *N. Amer. Mamm.* p. 634 (1857); Caton, *Antelope and Deer of America*, p. 105 (1877); J. A. Allen, *Bull. Amer. Mus.* vol. viii. p. 234 (1896).

Characters.—The Greenland reindeer appears nearly allied to the barren-ground race, having long, slender, rounded antlers, with few points, and showing great variability in form. There is a broad, sharply defined white ring round the eye; and a distinct, deep white band immediately above the hoofs. Not having seen specimens, I am unable to give further particulars about its coloration. In the antler figured by Dr. J. A. Allen there is a back-tine, but the bez has only two points.

Distribution.—Greenland.

f. BARREN-GROUND RACE—RANGIFER TARANDUS ARCTICUS

Cervus tarandus arcticus, Richardson, *Fauna Bor. Amer.* p. 239 (1829).

Tarandus arcticus, Baird, *U.S. Patt. Off. Rep. Agric.* 1851, p. 105.

Rangifer arcticus, J. A. Allen, *Bull. Amer. Mus.* vol. viii. p. 234 (1896).

Characters.—Size small. Antlers of male very long, slender, and rounded, with but few points on the expanded portion of the beam, which is separated by a long interval from the bez-tine; the latter tine, and generally one of the brows, more or less expanded; back-tine generally, if not always, wanting; female antlers much smaller, simpler, and scarcely curved at all.¹ As I have never seen a skin of this form, I can say nothing

¹ See figure on p. 104 of Mr. Caton's work.

as to the structure of the feet, and I am compelled to rely on Dr. Allen's notes as regards coloration. He states that instead of the narrow white ring above the hoofs found in the woodland reindeer, the whole foot and leg are white, with the exception of a tawny brown stripe running down the front of each, which narrows till it reaches the lateral hoofs. There is no distinct white ring round the eye; the amount of white on the muzzle is not stated.



FIG. 9.—Side view of Antlers of Male Barren-Ground Reindeer. From a specimen in the British Museum.

Contrasting the present with the woodland race, Mr Caton observes that the former has a foot similarly provided with coarse stiff hairs, but the white is much more extended. Instead of being confined to a narrow band surrounding the hoofs, while the leg is of a nut-brown shade, the whole foot and leg are white, except a tawny brown stripe extending down the front of each leg, with white hairs interspersed, diminishing in extent as it proceeds downwards till it terminates in front of the accessory hoofs.

The antlers herewith figured are fair average examples of those of this race; a much larger and still more characteristic pair are now exhibited on the top of the front of the reindeer case in the British Museum, but as one of the bez and both of the brow-tines are wanting, the specimen is not well adapted for figuring. These antlers are much longer than any examples of the woodland reindeer, and indeed this is very generally the case with this form, although its bodily size is so much inferior to that of the latter.

Distribution.—The barren districts lying to the northward of the forest zone in Arctic America, and extending to the confines of the Polar Sea.

Habits.—The gregarious nature and long migrations of this reindeer have been already alluded to under the head of the woodland race.

Although, unlike the latter, the present race is normally an inhabitant of open country, during its southern winter migration it enters the forest districts normally tenanted by the woodland caribou. According to Sir J. Richardson, the majority of the males and females herd together separately for the greater part of the year; in the winter the former retire for some distance into the woods, while the latter linger on the skirts of the barren-grounds and proceed to the neighbourhood of the coast quite early in the spring. Both the woodland and barren-ground races enjoy a plentiful supply of winter provender, since alike in Labrador and the districts farther north the reindeer-moss forms a carpet of a yard in depth, rendering it possible to traverse with ease boulder-clad districts which without this covering would be almost impassable. The pairing-season is stated to be later than that of the woodland race.

II. ELK—GENUS *ALCES*

Alce, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 303 (1827), as a sub-genus, *nec* Blumenbach, 1803.

Alces, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 125 (1835); Ogilby, *Proc. Zool. Soc.* 1836, p. 135; Gray, *List Mamm. Brit. Mus.* p. 182 (1843); Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 348 (1873), lxix. part i. p. 521 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 915; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 54 (1881).

Alcelaphus, Gloger, *Handbuch Naturgeschichte*, p. 143 (1841), *nec* de Blainville, 1816.

Cervalces, Scott, *Proc. Ac. Philadelphia*, 1885, p. 181.

Characters.—Lateral metacarpals as in *Rangifer*. Antlers present only in the males (as in all the following genera), situated low down on the skull, from which they arise at right angles to the median longitudinal line, extending at first directly outwards in the plane of the forehead, and finally expanding into a broad palmation margined with snags. As shown by immature—especially European—specimens, the antlers are essentially dichotomous, both main branches being palmated, but the upper much superior in size to the lower. Muzzle broad, long, and overhanging, with a very small triangular naked area between the lower angles of the nostrils; head and limbs very long, neck and body short; tail very short, main hoofs

long and pointed, lateral hoofs large. A small metatarsal gland and tarsal tuft, the former situated high up. Pelage, uniformly coloured at all ages and all seasons,¹ long and coarse; males provided with a peculiar pear-shaped pendulous expansion of skin covered with long hairs on the throat. In the skull, the nasal bones very short, and the nasal aperture consequently of great extent; gland-pit and vacuity between the bones of the face moderate. Upper molar teeth broad, low-crowned, and approximating to those of the giraffe. Size very large, and build clumsy.

With the exception of a certain similarity in the conformation of their



FIG. 10.—Front view of Frontlet and Antlers of Elk. From an immature specimen in the British Museum.

antlers to those of the American deer (with which they also agree in the structure of the lateral metacarpal bones), elk seem fully as isolated a type as reindeer. Although there is evidence of the existence of the genus since the Pliocene epoch, there is nothing definitely known as to its relationship with other members of the family. Essentially, as seen in immature specimens (Fig. 10), the antlers are of the forked, or dichotomous, type; the anterior prong of the fork simply dividing again, while the posterior prong splits into a fork of which the front prong is simple but the hinder branch expands to form the main palmation. In very old animals

¹ Young American elk are stated to show a faint dappling.

almost all the tines may unite to form a continuous palmation, although a more or less distinct cleft remains to mark the position of the first fork. The entire antler in immature specimens is not unlike that of the marsh-deer in general plan, with the exception of the different direction of the beam ; and it is remarkable that abnormal antlers of several of the American deer frequently exhibit a tendency to palmation. Whether this structural similarity between the antlers of *Alces* and *Mazama* does indicate a more or less intimate relationship, I am not prepared to say. Mr. Gordon Cameron, from the different direction of the beam, considers that it does not ; and the structure of the molars is decidedly different in the two, but we have yet to learn the morphological value of these characters. That the shortness of the nasal bones and the large size of the narial aperture of the skull are specialised features of comparatively modern acquisition, is evident from the fact that the skull of the young elk is much less different in this respect from that of an ordinary deer than is the case in the adult. This inference is also confirmed by the circumstance that the extinct North American form described as *Cervalces* has simpler antlers and longer nasal bones, thus indicating a more generalised type. And, in my opinion, this type does not seem worthy of more than specific distinction from the existing form.

Since the generic name *Alce*, from which the later *Alces* can scarcely be regarded as distinct, was first applied to the gigantic extinct fallow deer, it evidently properly belongs to the damine group of *Cervus*, and should thus supersede *Dama*. If such a change be thought desirable, *Cervalces* will apparently have to stand for the present genus, the existing species then taking the name of *C. alces*.

Some degree of uncertainty has existed as to the presence of a metatarsal gland, but the question has been answered in the affirmative by Dr. H. Nitsche,¹ who points out that this gland is similar to the corresponding one in *Mazama*, being naked with a marginal fringe of hair, instead of fully haired, as in *Cervus*. It must, however, apparently be very minute, as it is not visible in the mounted specimens in the British Museum, which exhibit the tarsal tuft very distinctly.

Distribution.—The more northern districts of the Holarctic region.

¹ *Zool. Anzeiger*, vol. xiv. p. 181 (1891).

1. THE ELK, OR MOOSE—ALCES MACHLIS

Cervus alces, Linn. *Syst. Nat.* ed. 12, vol. i. p. 92 (1766); Caton, *Antelope and Deer of America*, p. 69 (1877); Nehring, *Tundren und Steppen*, p. 107 (1890); Nitsche, *Zool. Anzeiger*, vol. xiv. p. 181 (1891).

Cervus alce, Boddaert, *Elenchus Animalium*, p. 135 (1785).

Cervus coronatus, Lesson, *Man. Mammalogie*, p. 356 (1827).

Cervus (Alce) alces, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 72, v. p. 303 (1827).

Cervus (Alce) coronatus, H. Smith, *l.c.* pp. 95 and 304.

Alces americanus, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 125 (1835); Merrick, *Mammals of Minnesota*, p. 270 (1892).

Alcelaphus alce, Gloger, *Handbuch Naturgeschichte*, p. 143 (1841).

Alces machlis, Ogilby, *Proc. Zool. Soc.* 1836; Brooke, *Proc. Zool. Soc.* 1878, p. 916; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 78 (1885); Grevé, *Zool. Garten*, vol. xxxv. p. 267 (1895); Ward, *Records of Big Game*, p. 50 (1896).

Alces palmatus, Gray, *List Mamm. Brit. Mus.* p. 182 (1843); Blasius, *Säugeth. Deutschl.* p. 434 (1857).

Alces (Cervus) alces, Sundevall, *K. Svensk. Vet. Ak. Handl.* for 1844, p. 176 (1846).

Cervus lobatus, Agassiz, *Proc. Boston Soc.* vol. ii. p. 188 (1846).

Alces malchis, Gray, *Knowsley Menagerie*, p. 56 (1850), *Cat. Ungulata British Museum*, p. 187 (1852), *Cat. Ruminants British Museum*, p. 66 (1872).

Alces muswa, Richardson, *Zool. of Herald.—Mamm.* p. 101 (1852).

Alces jubata, Fitzinger, *Naturges. Säugethiere*, vol. iv. p. 86 (1864), *SB. Ak. Wien*, vol. lxix. part i. p. 521 (1874).

Alce alces, Gilpin, *Mamm. Nova Scotia*, p. 119 (1871).

Alces lobata, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 348 (1873), lxix. part i. p. 528 (1874).

Alces lobata coronata, Fitzinger, *op. cit.* lxix. p. 528 (1874).

Alce americanus, Merriam, *Mammals of the Adirondacks*, p. 138 (1884); Miller, *Proc. Boston Soc.* vol. xxviii. p. 40 (1897).

Plate II

Characters.—The type species. Largest of living deer, the height at



MALE ELK.

NATIONAL MUSEUM MELBOURNE

the withers varying from 5 feet 9 inches to 6 feet 6 inches.¹ Antlers with a very short beam and the palmation so developed as frequently to obliterate almost all traces of the primitive form, with the exception of a remnant of the cleft of the first fork. Nasal bones of skull extremely short, and the premaxillæ not extending sufficiently far upwards on the front edges of the maxillæ to articulate with the nasals. Hair long, coarse, and rather brittle, longest about the neck. General colour varying from yellowish gray to deep blackish brown, generally darker in American than in European



FIG. 11.—Upper view of Skull and Antlers of Elk. From an American specimen in the possession of the Duke of Westminster. This appears to be the largest on record, the maximum span being 6 feet 1¼ inches.

examples ; lower portion of limbs whitish ; forehead dark chestnut ; face below the eyes nearly black, but reddish gray near the muzzle.

The winter coat, which in America first makes its appearance in September, is darker than the summer pelage ; and it is when first assumed that it is darkest, its colour gradually fading till the spring change. Moreover, it is only in animals of the second or third year that the winter coat attains its deepest sable, growing gradually lighter each succeeding year,

¹ The late Prof. Garrod, *Cassell's Natural History*, vol. iii. p. 51, gives the height at 8 feet ; the tallest specimen definitely recorded is a Canadian one shot by General R. S. Dashwood, which measured 6½ ft.

till in old males it becomes more or less grizzly. In regard to this senile fading, Mr. Caton writes as follows: "That this is much more the case with some than with others, we may not question, any more than that individuals of all ages differ very appreciably in colour, which is admitted by all. It is by far the darkest coloured of all our deer, and it is probably the darkest of any known deer of any part of the world. It has always been recognised as much darker than the Swedish elk, with which, I am entirely satisfied by critical examination, it is specifically identical." Not only does this last conclusion appear well founded, but it seems impossible to regard the Old World and New World elks as even representing distinct sub-species, although many zoologists refuse to believe that one form can be common to two separate continents. In weight an elk will scale from 900 to 1400 pounds, and the antlers may weigh as much as 60 pounds.

At the present day, European antlers never attain dimensions equal to those of the largest American examples, but it is possible that this may be due to the greatly diminished numbers of the former. As in the case of the reindeer, the locality of many of the elk antlers in the British Museum is unknown. The following are the seven largest specimens recorded by Mr. Rowland Ward, all being American:—

Length to Longest Point and on Inside Curve.	Circumference above Burr.	Tip to Tip Span.	Greatest Width.	Breadth of Palmation.
44	?	?	$61\frac{1}{2}$?
$43\frac{1}{4}$	$8\frac{1}{2}$	40	$59\frac{1}{4}$	$14\frac{1}{2}$
$42\frac{3}{4}$	10	$35\frac{3}{4}$	56	$13\frac{1}{4}$
?	?	?	67	?
41	$8\frac{1}{2}$?	?	$21\frac{3}{4}$
41	?	?	$54\frac{1}{2}$?
41	?	?	65	24

With regard to nomenclature, it is quite certain that, according to the strict rules of priority, *Alces machlis* is not the proper title for the elk. But the difficulty of arriving at a satisfactory conclusion as to what this should be is so great, that it seems preferable to allow the name commonly in use to remain. It is true this name is antedated by *Alces americanus*; but many naturalists would replace this by *Alces alces*, or *Alce alces*—combinations which do not meet with approval on my own part, and probably on that of many of my readers. Moreover, as mentioned above,

Alce properly belongs to the giant extinct fallow deer, and I have great hesitation in admitting that *Alces* is sufficiently distinct from *Alce* to be allowed to stand as a separate generic name. I have already suggested that *Cervalces* should be adopted for the genus, and *alces* for the species, but as it is probable many zoologists would refuse to admit that the type of the former is generically identical with the living elk, this sweeping change has not been made.

Distribution.—The forest and marshy districts of Norway and Sweden, Eastern Prussia, Livonia, Northern Russia, and thence eastwards through Siberia north of about latitude 50° to Amurland. In America the elk is found in Alaska, Montana, Nova Scotia, and New Brunswick. Baird gives



FIG. 12.—Antlers of Elk viewed obliquely. (Rowland Ward, *Records of Big Game*.)

the distribution in his time as “west coasts of America from the shores of the Arctic Ocean nearly to the Columbia River. Farther east the northern limit is about 65° , and thence through Canada to Maine, New Hampshire, Vermont, and the northern parts of New York.” From the Adirondack region of New York it was exterminated about 1861. It has been commonly stated that the elk occurs in the Caucasus, but this, according to Dr. K. Satunin,¹ is an error, although it may not improbably range to the forests on the northern flank. In Europe the range of the elk has been steadily contracting for centuries, while everywhere its numbers are rapidly diminishing. In Saxony the last example was slain in 1746, and in Silesia in 1776. In Julius Cæsar’s time it was abundant in the Black Forest, and even in the third century seems to have been spread over all

¹ *Zool. Jahrbuch Syst.* vol. ix. p. 309 (1896).

the forest-clad portions of Germany, while its range also included Britain. Although so much diminished in numbers in Europe, elk are said to be still abundant in the valley of the Lena, in the neighbourhood of Lake Baikal, in Amurland, Mongolia, and Tungusia. In Norway they are chiefly found in the eastern provinces of the south, while in Sweden their home is the primeval forests clothing the chief mountain range. Antlers and bones referable to this species have been obtained from the superficial deposits of Cleveland, Walthamstow, and other parts of England, some of which are preserved in the British Museum. The following paragraph taken from the *Times* of 2nd January 1891 affords interesting information as to the number of elk and reindeer in Scandinavia :—"The total number of elk killed in Norway last year was 850, of which 515 were male and 335 female, and of the eleven provinces in which they were killed, Northern Trondhjem contributed 303. The number of reindeer killed during the same period was 468, and 143 of them were killed in the province of Romsdal. The number of elk killed in Sweden during the same period was 1782, as against 2097 and 2178 in the two preceding years, and it has been remarked for some time that the number of elk in Sweden has been diminishing."

Habits.—The long limbs and deeply cleft hoofs of the elk show that it is adapted to dwelling in marshy ground ; while the short neck and the long, fleshy, prehensile muzzle indicate as clearly that it is a browsing animal and unable to graze like other deer. In both hemispheres elk are, indeed, essentially forest-dwelling animals, their favourite haunts in the Scandinavian peninsula being the boundless forests of spruce and birch clothing the central plateau. According to Mr. E. N. Buxton, in Norway they are, however, much more abundant in the forests of deciduous trees than in those composed of conifers, their food in summer consisting to a great extent of the leaves of the mountain-ash.

At this season their feeding time is in the early morning, and again in the evening ; and by about ten o'clock in the morning they betake themselves to their resting-places, from which, if unmolested, they do not stir till about three in the afternoon. Elk are remarkable for their acuteness of hearing, and are consequently exceedingly difficult to approach. In districts where they are much hunted one of their favourite devices to avoid successful pursuit is to return for a longer or shorter distance now and

again on the leeward side of their path, so that they are sure to receive the scent of any person or animal following their trail. Whether the Scandinavian elk is as fond of wading after aquatic plants as its western brother, I have been unable to ascertain.

As a rule, elk in both hemispheres do not associate in herds, although a few may collect together during winter. For a considerable part of the year the stags and hinds keep more or less apart, but at the beginning of the hunting season in Norway a male and female, together with one or two



FIG. 13.—Elk in the Park at Woburn Abbey. From a photograph by the Duchess of Bedford.

calves, may frequently be found in company, although at the same time other individuals of both sexes roam about alone. The pairing-season in Norway commences about the latter part of September, and at this time the stags become extremely pugnacious. During this season both sexes “call,” the cry of the female having been compared to the roar of an angry bear. Many hunters, however, have stated that they have constantly hunted elk in Norway without ever hearing them call; and Sir Henry Pottinger in the *Badminton Library* suggests that elk may possibly be less noisy in Scandinavia than they are in America. During the season

in question the male elk eats but little, and consequently gets into very poor condition. The fawns, which may be either one or two in number, and very rarely three, are produced in the spring.

In America, where the elk is known as the moose, and the former name transferred to the wapiti, the general habits of the animal are very similar to those of its European brother. Its favourite haunts are the dense thickets situated round the swamps and shallow lakes near the sources of the North American streams. In winter they resort to higher ground, where boughs are abundant; and at this season, as the snow increases in depth and hardens, one or more individuals form what is known as "moose yards," which may be of very considerable extent, and are kept open by constant trampling. It is commonly said that the males and females "yard" by themselves, but this is expressly denied by Mr. C. C. Ward,¹ although it seems to be ascertained that very old males will often winter by themselves. The "yard" is situated in a district where white poplar, maple, and mountain-ash are abundant; and although the latter of these form the staple food of the imprisoned elk, yet the needles and young twigs of juniper, balsam-fir, and other conifers are also consumed. "During their confinement in yards at the height of winter," writes Mr. Herrick,² "the accessible shrubs are very closely cropped, but ordinarily the tree is not killed, since only one side is stripped. The bark is removed to a height of ten feet, as the animal rears upon its hind legs and peels the bark. The direction a herd is moving may be ascertained by one familiar with their habits, since the bushes browsed are pulled towards the animal. The fir trees are browsed but the bark is not eaten, yet hunters state that young firs suffer more than other species from the habit of the males of rubbing their heads upon them in such a way as to apply the balsam to the abraded skin about the horns."

Although the union is only for a season, the male elk in America, as in Scandinavia, selects a single female at the commencement of the pairing-season, with whom he retires to the densest thickets for a period of three weeks or a month. Here the two remain peaceably, unless disturbed by the intrusion of another male, when a fierce struggle immediately takes place. The antlers of the males are shed during January, and the new pair

¹ In Mayer's *Sport with Gun and Rod*, p. 159.

² *Mammals of Minnesota*, p. 273.

attain their full development by August. While the antlers are in velvet elk are extremely fond of wading deep into the water, where they lazily crop the spreading leaves of the yellow water-lily, or pull up its succulent roots from the mud. An elk which lived for some time at Woburn Abbey displayed this habit very frequently, and was often to be seen standing in one of the lakes in the park up to its belly. American elk seem to be less given to repose throughout the greater part of the day than are those of Norway, and are stated to feed during the mid-day hours. As soon as the antlers are free from velvet, the males leave the denser thickets to take to more open ground, where they commence calling. This call may be answered either by the challenge of a rival male, or by the softer note of an expectant female. When about to give birth to her fawn, the latter seeks a secluded situation fairly safe from the intrusion of wolves or bears.

Elk generally run with a long swinging trot, which can be maintained without any perceptible slackening for an incredible length of time; but if forced into a gallop, they soon tire. "Formerly," writes Mr. Lloyd,¹ "these animals were made use of to draw sledges; but owing, as it was said, to their speed frequently accelerating the escape of people who had been guilty of murder or other crimes, their use was prohibited under great penalties. Though I apprehend these ordinances, if not abrogated, are obsolete, I am not aware that elk are ever made use of in that kingdom at the present day either to draw a sledge or for other domestic purposes." In a later work (*Scandinavian Adventures*) the same author mentions that he has known several instances of Swedish elk which were taken young becoming as tame as domestic cattle; and Mr. Caton bears similar testimony with regard to the American elk.

2. JOHNSON'S ELK—ALCES LATIFRONS (*Extinct*)

Cervus latifrons, Johnson, *Ann. Mag. Nat. Hist.* ser. 4, vol. xiii. p. 2 (1874).

Alces latifrons, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 78 (1885); Dawkins, *Brit. Pleist. Mamm.* part vi. *Cervidæ*, p. 1 (*Pal. Soc.* 1887).

Cervus alces latifrontis, Pohlig, *Palæontographica*, vol. xxxix. p. 238 (1892).

Characters.—Probably closely allied to the next species, with which,

¹ *Field Sports of the North of Europe*, p. 336.

when compared with the living species, it agrees in the greater relative length of the beam and the simpler palmation of the antlers, of which some good examples are figured by Professor Dawkins in the monograph cited.

Distribution.—Europe, in the Lower Plistocene epoch, the known remains having been obtained from the Norfolk forest-bed and Thuringia.

3. SCOTT'S ELK—*ALCES SCOTTI* (*Extinct*)

Cervus americanus, Harlan, *Fauna Americana*, p. 245 (1825), *nec* Erxleben, 1777.

Cervalces americanus,¹ Scott, *Proc. Ac. Philadelphia*, 1885, p. 181.

Characters.—Beam of antlers relatively much longer than in *A. machlis*, and palmation smaller and more distinctly divided into an anterior and



FIG. 14.—Skull and Antlers of Scott's Extinct Elk from the Plistocene of North America.
After Dr. W. B. Scott.

posterior branch, with two outwardly directed snags near their line of division. Nasals longer, and the premaxillæ extending upwards to unite with them.

Distribution.—North America, in the Plistocene period. Although this is undoubtedly a more generalised form, I see no reason for separating it generically from the existing elk. The outward direction of the beam of the antlers shows that there is no approximation to *Cervus*.

¹ This species requires a new name, *Cervus americanus* being preoccupied.

III. THE TYPICAL DEER—GENUS CERVUS

Cervus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 92 (1766).

Lateral metacarpals represented only by their upper (proximal) ends. Antlers arising at acute angles to the median line of the skull (as in the following genera), at first projecting from the plane of the forehead, and then continued upwards nearly in that plane, supported on short pedicles, and furnished with a brow-tine arising close to or a short distance above



FIG. 15. —Antlers of Red Deer. From a German specimen in the collection of Viscount Powerscourt.

the burr, never regularly forked at first division, but generally of large size and more or less complex structure ; skull without frontal ridges forming the bases of the pedicles of the antlers. Muzzle with a considerable naked area surrounding the nostrils ; ears generally large ; tail moderately or very short ; face long. Pelage variable ; main hoofs long and pointed ; lateral hoofs moderate. A metatarsal gland and tuft,¹ situated (except in *C. albirostris*) high up on the cannon-bone, present, but no tarsal gland or tuft. In the skull the nasal bones (as in the following genera) well

¹ Absent in *C. duvauceli*.

developed, the gland-pit large and deep, and the unossified vacuity extensive ; face-gland variable. Upper canines small or wanting ; cheek-teeth large and more or less high-crowned. Stature generally large or medium, and rump low.

The question of the limitations of the genus is one on which very different views are entertained. Taking the antlers as a basis of classification, the forms without a brow-tine, such as Père David's deer, may be eliminated. With regard to the others, the sikine deer are related so closely to the red deer group on the one hand, and to the fallow deer on the other, that sub-generic division seems preferable in their case. The Oriental deer, forming the rusine and rucervine groups, are more distinct, but, on the whole, as they possess the brow-tine, it seems more convenient to include them in the same genus, which will thus embrace all the larger Old World deer with brow-tines to the antlers of the males, and the antlers themselves bearing at least three tines.

Distribution.—The Holarctic and Oriental regions ; represented in the Western Holarctic only by the wapiti.

i. THE RED DEER, OR ELAPHINE GROUP—SUB-GENUS CERVUS

Elaphus, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 307 (1827).

Pseudocervus, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 904 (1841).

Strongyloceros, Owen, *Brit. Foss. Mamm. and Birds*, p. 470 (1846) ; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 850 (1873).

Characters.—Antlers rounded, complex, usually with five or more tines, generally including a bez (second), and always a trez (third). Pelage of adult, at least in winter, uniformly coloured, generally with a large pale-coloured area surrounding and including the tail, below which it usually passes into white ; in the young, spotted with white ; metatarsal tuft coloured like rest of leg. Throat maned ; ears large ; tail short. Naked portion of muzzle not extending much on to the upper surface of the face, with its superior border forming an acute angle, and the portion below the nostrils constricted to a narrow bar, and then expanding to join the upper lip. Upper canines present ; upper molars moderately tall, with a flattened additional column on the inner side. The face-gland, or tear-pit, always of moderate development. Size large.

As regards the number of their tines, the antlers of this group are evidently the most specialised of all the existing members of the genus, no other group having brow, bez, and trez all normally developed. Cupping in the crown of the antler, as a normal feature, seems to be in the main confined to the red deer, where it is most developed in its typical or western form, although occasionally found in the wapiti; and as we proceed eastwards the type of antler gradually simplifies. It has been suggested that "cupping" is a modern feature solely due to high feeding; but it is observable in the antlers preserved in several of the old German castles, and also in many prehistoric specimens from the British fens. This is finely exemplified in a magnificent pair of antlers from an Irish bog preserved in the British Museum, one of which is figured on page 472 of Owen's *British Fossil Mammals and Birds*. All the members of the red deer group from Central Asia have comparatively simple uncupped antlers, the most primitive type being displayed by Thorold's deer, in which the antlers are flattened and have no bez-tine. This type of antler approximates closely to that of the sikine group,



FIG. 16. Antlers of Red Deer from Scotland, with fully developed cups. (Rowland Ward, *Records of Big Game*.)

from which the elaphines are doubtless derived. Central Asia may, indeed, be regarded as the original home of the present group, where it probably developed from the sikines. One branch from this primitive stock seems to have spread westward to culminate in the modern red deer, and succeeded in reaching as far south as North Africa, at a time when that area was in immediate connection with Europe. A second branch is formed by the wapitis, of which two races are still inhabitants of Central and North-Eastern Asia, while the third and fourth migrated by way of what is now Bering Strait to North America.

The generally uniform coloration of the adult pelage, and the develop-

ment of the large light area in the caudal region, must likewise be regarded as specialised features ; but it is interesting to note that the caudal disk is least developed in some of the Central Asiatic species, in which the markings are very like those of the sikas. Evidence of affinity with that group is further proclaimed by the dappled coat of the fawns. And although it is generally stated that the adult pelage is entirely unspotted, one or more rows of such spots may frequently be detected in English red deer hinds in the summer coat, and a herd of Caspian red deer in the same pelage living at Woburn Abbey in the summer of 1897 were



FIG. 17.—Group of Red Deer at Woburn Abbey. From a photograph by the Duchess of Bedford.

almost as much spotted as many sikas at the same time of year. In all members of the present group the velvet of the antlers is of a grayish fawn colour.

Distribution.—The Holarctic region, dating from the Plistocene epoch.

1. THE RED DEER—*CERVUS ELAPHUS*

Cervus elaphus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 93 (1766) ; Jenyns, *Brit. Vert. Animals*, p. 37 (1835) ; Bell, *Brit. Quadrupeds*, p. 394 (1837) ; Keyserling and Blasius, *Wirbelth. Europ.* p. 26 (1840) ; P. L. Sclater, *Trans. Zool. Soc.* vol. vii. p. 342 (1871) ; Fitzinger, *SB. Ak. Wien*, vol. lxi. part i. p. 565 (1874) ; Ward, *Records of Big Game*, p. 22 (1896) ; Satunin, *Zool. Jahrb. Syst.* vol. ix. p. 309 (1896) ; Büchner, *Ann. Mus. Zool. St. Petersburg*, 1896, p. 387.

Cervus (Elaphus) elaphus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 90, v. p. 367 (1827).

Cervus primigenius, Kaup, *Jahrb. Mineral.* 1839, p. 168.

Cervus priscus, Kaup, *op. cit.* p. 297 (1839).

Cervus (Strongyloceros) elaphus, Owen, *Brit. Foss. Mamm. and Birds*, p. 472 (1846).

Characters.—Height reaching to 4 feet, or 4 feet 6 inches, at the shoulder. Antlers rounded throughout, normally with a bez-tine and more than five points; when fully developed, forming a more or less distinct cup at the crown, the brow-tine rising close to the burr, and frequently longer than the bez, and the fourth tine not specially enlarged and not situated in the same plane as the portion above, but in fully developed specimens more or less completely included in the terminal cup. Tail rather long and pointed, and the light caudal disk of moderate dimensions; ear longer than half the head; general colour of adult summer pelage typically reddish brown, of winter pelage grayish brown; mane not markedly darker than rest of coat, and under-parts lighter than the back; no white on the muzzle. Cry of male in the breeding-season a distinct roar, somewhat like that of a leopard.

Although the great cupping and complexity of the crown of the antlers of the typical European red deer indicate great specialisation, yet the red summer pelage, which is evidently a retention of the colour of the fawn and of that of the sikas, as well as the comparatively long tail, shows that in some respects the species is more generalised than several of the Asiatic forms and the wapiti, in which the red tinge is more or less completely lost, spots never show themselves in the adults, and the tail is shorter.

Distribution.—Europe, North Africa, Asia Minor, and Northern Persia.

a. EUROPEAN RACE—*CERVUS ELAPHUS TYPICUS*

Cervus elaphus germanicus, Desmarest, *Mammalogie*, vol. ii. p. 434 (1822); Fitzinger, *Beitr. Landesk. Österreichs*, vol. i. p. 317 (1832), *SB. Ak. Wien*, vol. lxi. part i. p. 573 (1874).

Characters.—Height at shoulder reaching to about 4 feet (often less in Scotch examples); face comparatively short and blunt; general colour of pelage of upper-parts reddish brown in summer and grayish brown in

winter,¹ the caudal disk being pale straw, passing into white on the inner side of the thighs, and in adults bordered by a blackish band ; face, throat, legs, and under-parts more or less slaty gray ; antlers, when fully developed, attaining great complexity in the crown, the number of points on each frequently reaching twelve or fourteen.

As in the other varieties, the summer pelage is short and glistening, but that of winter is longer and rougher. During the summer the head and legs are grayer than the body, and the throat of a still paler gray, the fringe of long hair on the throat attaining its greatest development in the breeding-season. Regarding the colour of the European form, Mr. A. Gordon Cameron writes as follows : “ It is the fashion nowadays to say that red deer are not red, but the present writer is not of this opinion. Place a band of deer, whether stags or hinds, among green bracken under an August sun, and it will be seen at once that red deer are rightly named. While red is the prevailing colour, deer are met with in all shades, from dark brown, verging on black, to pale cream or dun, verging on white. Black deer and white deer are on record. Attempts to establish any fixed rule or relation between colour and condition—*e.g.* that good stags are iron gray, or that good hinds (to shoot) are blue—seem scarcely justified by facts, for plenty of good stags and hinds are red or yellow by nature, and the pink of condition will do no more than put an extra gloss on their coats. Wasting deer tend to grow paler in colour, and look ragged from loss of bloom.” In park deer, spots, especially along the middle of the back, are occasionally visible in the summer pelage.

The typical red deer varies greatly in point of bodily size and in the relative development of its antlers. The largest examples are met with in the forests of the Continent, and the smallest in islands, such as Harris. The antlers of Scotch hill deer, although comparatively small, yield to none in symmetry of form and gracefulness. By far the finest series of antlers in existence are those preserved in the King of Saxony's castle at Moritzburg, near Dresden, many of which have been figured by Dr. A. B. Meyer in the work cited in the Appendix. Among these, specimens with twelve, thirteen, and fourteen, or even more points on each side are by no means uncommon. Sir Victor Brooke observes that “ a comparison of the gigantic antlers of the red deer of the fifteenth, sixteenth, and seventeenth centuries

¹ Park deer frequently remain more or less red throughout the year.

preserved in the old hunting schloss at Moritzburg (built 1540), near Dresden, with antlers from the islands of Harris and Sardinia shows in a most striking manner the great variations to which this species is subject. Some of the antlers at Moritzburg measure 50 inches along the outside curve, are 10 inches in circumference round the smallest part of the beam, and the two antlers carry from twenty-four to fifty points. The spread between the coronal tines of one specimen is 74 inches. Antlers from Harris and Sardinia rarely exceed 30 inches in length, their circumference being about



FIG. 18.—Antlers of Red Deer. From a specimen in the Castle at Moritzburg, Saxony.
After Dr. A. B. Meyer.

4 inches ; they very rarely carry a larger number than twelve points, and their span seldom exceeds 28 inches.”

A pair of the Moritzburg antlers are shown in Fig. 18. Nothing like these are to be found at the present day, unless it be occasionally in Hungary, and as these fine specimens are not recorded in Mr. Ward's book, it is useless to quote the smaller measurements given there. The contrast between the Moritzburg antlers and those of the Caspian red deer is very marked ; and it is very rarely that the short bez-tine so often found in the latter is noticeable in the former. Next to the Moritzburg collection comes one belonging to Count Arco-Zinneberg, now preserved in his house at Wittels-

bacher Platz, Munich. Among British collections, that of Viscount Powerscourt, at Powerscourt, Enniskerry, Ireland, claims a very prominent position, one of the specimens from this series being represented in Fig. 15. The great hall at Hampton Court contains a small but unusually fine series of red deer antlers, all of which appear to be of great antiquity, and doubtless came from the Continent. Several of them appear equal in size and number of points to some of the Moritzburg specimens, and the collection is probably unrivalled in Britain. It also includes a few examples of wapiti antlers, and some remarkably fine specimens of those of the elk.

Fig. 19 shows the antlers of a wild red deer from Exmoor. It has six tines, and serves to exhibit the difference between such red deer antlers and those of the wapiti (Fig. 24, p. 95), the fourth tine being comparatively small, and projecting externally to the beam, quite out of the plane of the two terminal tines, whereas in the latter the fourth tine is very large, and projects inwardly in the plane of the two terminal tines. In the island of Jura there exists a remarkable breed of red deer, locally known as "cromies," and characterised by the peculiar downward curvature of their antlers. Although deer with these appendages normally developed also live in the island, the two are stated never to interbreed, but to keep apart.

Distribution.—The greater part of Europe, probably as far east as the Don and Volga, but exclusive of much of the region in the neighbourhood of the Black Sea and the Eastern Carpathians; farther northwards there is a want of definite information with regard to the eastern range.¹ Sir Victor Brooke gives the following list of countries and districts now inhabited by wild red deer of the typical variety, viz. Ireland, County Kerry; Great Britain, Devonshire and Somerset, Highlands of Scotland, and the islands of Harris, Skye, Rum, Mull, Jura, and Arran; Isle of Hitteren, Norway; the south of Sweden, France, Spain, Austria-Hungary, Turkey, and Greece. Italy, it will be noticed, is omitted from this list, although it is included in the habitat of the race in Bell's *British Quadrupeds*; and from Switzerland the red deer has long since completely disappeared. From a series of heads belonging to the Duc d'Orléans, which I have lately had the opportunity of seeing, it appears that the Spanish red deer has a very

¹ Dr. E. Büchner has published a paper on this subject, but does not clearly distinguish between the typical and Caspian races.

red summer pelage (the specimens were shot towards the end of March), and that the antlers are comparatively weak, markedly curved, and with the bez-tine generally, if not invariably, wanting. Not impossibly the Spanish deer may prove to be closely allied to, or perhaps identical with, the North African race of the species. As already mentioned, antlers indistinguishable from those of the typical race are of common occurrence in the fens and some of the other more superficial deposits in the British



FIG. 19.—Frontlet and Antlers of Red Deer. From an Exmoor specimen in the possession of Lord Elphinstone.

Islands, but those from some at least of the Plistocene beds of both Britain and the Continent appear referable to the Caspian variety.

Habits.—So much has been written on the mode of life of the red deer, especially in Scotland, that a comparatively short notice will suffice on this occasion. For the following paragraphs I am indebted to Mr. Allan Gordon Cameron, who has had special opportunities of observing Scottish red deer in their native haunts. In the Highlands red deer are found on the open hills, seeking food and shelter in storm-swept glens, and in this respect living under conditions quite different from those natural to the species in other lands. Isolated for centuries from their continental

relatives, they exhibit in their relatively small dimensions the characteristic of an island race, retaining, nevertheless, amid the sterile grandeur of their mountain home an elegance and dignity of appearance unsurpassed by any of their congeners. The hinds breed in their third year and calve when three years old, producing, with rare exceptions, but one at a birth, and remaining fertile, under favourable conditions, so long as they live. The fawn is dropped in early summer on the heather, wherein for some days it will lie closely concealed till able to run with its mother, whom it will accompany thereafter, if a male, for a year, and if a female, for two years. The sexes occur at birth in nearly equal proportions, but probably not more than half those born survive as yearlings, and the mortality of males seems to exceed that of females from an early age. Hill stags attain maturity at twelve years old, and appear to decline, as a rule, some five or six years after, but their maturity is sometimes prolonged, for a Jura stag, which had reached its prime when first observed, was still in best condition when killed twelve years later. The calibre of a stag's head, like the condition of its body, has its periods of advance, maturity, and decline, which vary with individuals and cannot be precisely determined; but, excepting disease or accident, the same style of head will throughout life infallibly distinguish the same stag. A Royal stag in Cromarty carried a twelve-point head for thirteen seasons, and put out a thirteenth point in his fourteenth season, though his antlers then appeared to be losing weight. Old stags lose their front teeth, fall off in condition, and deteriorate generally, and the extreme term of their natural life may be placed at thirty years. Hinds mature earlier, and are probably, on an average, longer lived than stags. A Jura hind, which was full grown, with a big fawn, when first observed, retained all her teeth and was still fertile twenty-one years later, when accidentally killed, having reared twenty fawns during the period of observation. With both sexes, and at all ages, the chief cause of death is parasitic disease—lung-worms, intestinal worms, and liver-flukes, the first named being by far the most destructive, and probably responsible for great periodical mortality among fawns. Wet seasons make the highest death-rate, and spring is the deadly time.

Stags shed their antlers in spring (March to May), earlier or later according to age and condition, and attain their prime for the year in autumn (September), shortly after the new antlers are hard and clean, and

a little before the pairing-season, which about the middle of October is at its height. Owing to the large numbers of deer gathered on the bare hills, the pairing-season in the Highlands presents a combination of scene and sound without parallel in continental forests. The hills re-echo with the roaring of rival stags, which roam to and fro, restless and defiant, now rolling in the peat-pools, now rounding up their hinds, and now fighting desperate battles. With individual deer the spur of sexual excitement will sometimes totally dispel the fear of man. Thus a wild stag in Jura once



FIG. 20.—A Red Deer in the Park at Woburn Abbey. From a photograph by the Duchess of Bedford.

took possession of some tame hinds that were accustomed to be hand-fed, and for the time being resolutely guarded them from all interference. Contrary to the general opinion, mastership in the herd goes to the weightiest and most vigorous stag without respect to the calibre of his antlers, so-called "bald" stags being not unfrequently masters of large herds. Stags lose condition rapidly during the pairing-season, at the close of which they are completely exhausted.

Except in the pairing-season, adult stags and hinds do not associate freely, but lead to some extent independent lives in large or small bands,

the numbers and distribution of which are determined chiefly by conditions of food and weather. In summer, with fine weather and abundant food, deer are scattered all over the ground in small parties and at high elevations; in winter, when food is scarce and the weather severe, they shift to lower levels, are more concentrated, and seek sheltered places. Hinds have a strong homing instinct and seldom leave the ground where they are bred; but stags are great travellers and exhibit a twofold migratory impulse, namely, a general shift from summer to winter quarters, and a special shift from summer quarters to the accustomed pairing-ground, the same places, however, being sought at the same season year by year. Deer take the sea fearlessly and swim strongly, stags introduced into Hoy Island, Orkney, having swum southwards to the coast of Sutherland, and northwards as far as the Bay of Skail, in the Mainland of Orkney, in either case a distance, as the crow flies, of eight miles. Hill deer, like wood deer, feed in the morning and evening and rest during the day. They are dainty feeders, requiring a wide range for their support, since they neither bite closely on a limited area like sheep, nor tear coarse herbage with the aid of a pliant tongue like cattle, but pick here and there, nipping the tender tops of plants that suit them, and moving forward all the time to fresh places. The appetite of both sexes for bones and antlers, which they grind with the cheek-teeth, is a familiar fact, as is also their taste for sea-weed, of which sea-coast deer partake freely, while not a few stags frequenting inland districts make periodical journeys to the coast for its sake. High ground affords the sweetest pasturage, and deer that dwell habitually on the hill-tops make the best venison. It is a habit of deer, though probably not an invariable one, to drink before feeding. Stags accustomed to herd together exhibit a strong affection for their companions, living in perfect harmony, and being always under a recognised leadership, but whether of the oldest or heaviest stag cannot be determined. Hinds are less ceremonious, more independent, and occasionally quarrelsome, often fighting with their fore feet, and rearing straight up on their hind legs. Although not specially keen-sighted, red deer have their senses of smell and hearing acute. Hence, when disturbed or travelling, they always move to windward, and when resting their favourite position is on the lee side of sloping or rising ground, just below the ridge or crest, facing the landscape with the wind in their backs. Stags that have been shot at,

or otherwise alarmed, have often been observed to travel some distance and then deliberately lie down in such a position that danger approaching from in front is seen, and danger from behind scented. Hence they are most readily approached after feeding. As mentioned by Mr. Cameron in the foregoing notes, the red deer hind attends to the needs of her offspring with remarkable assiduity ; the fawn being generally born among heather or other suitable covert, where it is left alone during the day, and visited by its parent at nightfall. To make it lie down, according to Mr. Scrope, the mother presses the fawn with her nose ; and when once settled comfortably, remains curled up throughout the day. The hind does not, however, depart far from her offspring, which she is always ready to defend from danger. This affectionate care of the hind for her fawn—whether the species referred to be the red deer or the fallow deer—did not escape the notice of Xenophon. As translated by Mr. H. G. Dakyns, he has the following observations in his essay on hunting. “As day breaks, he [the hunter] will espy the hinds leading their fawns to the places where they will lay them severally to rest. Having made them lie down and suckled them, they will cast anxious glances this way and that to see that no one watches them ; and then they will severally withdraw to the side opposite and mount guard, each over her own offspring. . . . When his eye has lit upon the object of his search, he will approach quite close. The fawn will keep perfectly still, glued as it were to earth, and with loud bleats suffer itself to be picked up ; unless it happen to be drenched with rain ; in which case, it will not stay quiet in one place. . . . The huntsman having seized the fawn, will hand it to the keeper. The bleating will continue ; and the hind, partly seeing and partly hearing, will bear down full tilt upon the man who has got her young, in her desire to rescue it. . . . Young fawns may be captured in the way described. Those that are already big will give more trouble, since they graze with their mothers and the other deer, and when pursued retire in the middle of the herd or occasionally in front, but very seldom in the rear. The deer, moreover, in order to protect their young will do battle with the hounds and trample them under foot ; so that capture is not easy, unless you come at once to close quarters and scatter the herd, with the result that one or another of the fawns is isolated.” All this is almost absolutely true to nature.

b. CORSICAN RACE—CERVUS ELAPHUS CORSICANUS

Cervus elaphus corsicanus, Erxleben, *Syst. Regn. Animal.* vol. i. p. 304 (1777).

Cervus mediterraneus, de Blainville, *Journ. Physique*, vol. xciv. p. 262 (1822); Gervais, *Hist. Nat. Mamm.* vol. ii. p. 216 (1855).

Cervus elaphus minor, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 575 (1874).

Characters.—The smallest race of the species, and according to Sir Victor Brooke connecting the European with the North African race, although Gervais regards it as closely allied to the latter, with which it is identified by M. Lataste. If this latter view be correct, the name *corsicanus*, as the earlier, must supersede *barbarus*. General colour of the pelage of the upper-parts dark brown, becoming blackish in winter.

Distribution.—Corsica and Sardinia. Fitzinger, on the authority of Polybius, states that deer are not indigenous to either of these islands, and were introduced by human agency, but this requires confirmation.

c. NORTH AFRICAN RACE—CERVUS ELAPHUS BARBARUS

Cervus barbarus, Bennett, *List Anim. Gardens Zool. Soc.* p. 31 (1837); Gray, *Cat. Ungulata Brit. Mus.* p. 197 (1852), *Cat. Ruminants Brit. Mus.* p. 68 (1872); Sclater, *Trans. Zool. Soc.* vol. vii. p. 344 (1871); Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 577 (1874).

Cervus corsicanus, Lataste, *Act. Soc. Linn. Bordeaux*, vol. xxxix. p. 286 (1885).

Characters.—Smaller than the typical, but larger than the Corsican race; generally lacking the bez-tine to the antlers; pelage (? summer) dark brown, with a grayish brown streak down the middle of the back, and small irregular whitish spots on the flanks, and sometimes on the back.

Although formerly living in the menagerie at Knowsley, and in the London and Paris Zoological Gardens, this deer appears to be now very rarely imported, and I have never seen an example. The British Museum possesses several pairs of antlers which are curved forward near the middle of their length somewhat after the manner of those of the shou. Since,

however, all these very probably belong to the same animal, this may be merely an individual peculiarity. According to Sir Victor Brooke, the still smaller red deer from Sardinia and Corsica "completely bridge over the characters which have been advanced as distinctive of the African and European races." The red deer being essentially a northern form, the loss of the bez-tine in the southern race may be due to degeneracy owing to the unsuitability of a warmer climate to full development.

Distribution.—North-Western Africa, in Tunisia and Algeria, more especially in the forests of Constantine between Bone and Calle and also in the district of Tabessa. On the plains in the neighbourhood of Douirat a correspondent of M. Lataste states that this deer is found in open country where there is not a vestige of a tree. To the Moors it is known as the alwassi. The possibility of the Spanish red deer belonging to this race has been already mentioned.

I have no information as to the habits of this race, which are, however, doubtless generally similar to those of the typical form.

d. CASPIAN RACE —CERVUS ELAPHUS MARAL

Cervus maral, Ogilby, *Rep. Council Zool. Soc.* 1840, p. 22; Sclater, *Trans. Zool. Soc.* vol. vii. p. 336 (1871); Gray, *Cat. Ruminants Brit. Mus.* p. 69 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 597 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 812; Satunin, *Zool. Jahrb. Syst.* vol. ix. p. 309 (1896); Ward, *Records of Big Game*, p. 30 (1896).

(?) *Strongyloceros spelæus*, Owen, *Brit. Foss. Mamm. and Birds*, p. 469 (1846).

(?) *Cervus elaphus varius*, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 574 (1874).

Cervus elaphus antiqui, Pohlig, *Palæontographica*, vol. xxxix. p. 246 (1892).

Characters.—Size somewhat larger (the height at the shoulder reaching to 4 feet 6 inches) than in the typical race of the species, the build stouter, the neck thicker, and the head longer and more pointed. General colour of summer pelage red, in immature animals frequently, if not invariably, marked with numerous yellowish spots; winter pelage dark slaty gray, with the caudal disk a deeper yellow than in the typical race, and the shoulders,

thighs, and under-parts nearly black. Antlers large and less complex than those of the latter, the number of points seldom exceeding eight, and being often only six ; the bez-tine, which may be absent, frequently much shorter than the brow-tine, which is long and much curved upwards ; and the fourth tine generally more distinct from the crown.



FIG. 21.—Head of Caspian Red Deer, from a specimen shot in Asia Minor by Mr. F. C. Selous.
(Rowland Ward, *Records of Big Game*.)

That this form is not entitled to rank as a distinct species seems fairly certain. It appears impossible to formulate a precise definition, but the race may be roughly described as large red deer with relatively long faces, spotted summer coats when immature, and with large antlers of a simpler type than equally large and fully adult specimens of the typical race, the bez-tine being often proportionately much shorter than in the latter. This

last feature is, however, by no means constant, and in the handsome head represented in Fig. 21, the brow- and bez-tine are of approximately equal length. Out of four fine specimens obtained by Mr. E. N. Buxton, of Knighton, Buckhurst Hill, from Tartarow, in the Galician Carpathians, two have the bez-tine very short, in the third there is a very short bez on one side only, and in the fourth this tine is absent on both sides. On the other hand, in the seven-pointed Hungarian antlers from the collection of Viscount Powerscourt shown in Fig. 3, the brow- and bez-tine are of approximately equal length, so that it is evident that the shortness of the latter can in no wise be regarded as invariably distinctive of the race. At the same time it must be remembered that Hungary is on the borderland between the habitats of the two races; and it is therefore to be expected that antlers from this district would exhibit intermediate characters. Indeed, it is only provisionally that Lord Powerscourt's specimen is assigned to the eastern race.

Antlers seldom, if ever, attain the extreme complexity of the typical red deer as exemplified by old German examples (Fig. 18) or specimens from the English peat or Irish bogs; and Fitzinger gives the number of points on the crown as not exceeding two or three. But a specimen from the North-Western Caucasus, presented by Mr. St. George Littledale to the British Museum, has eight points, and Mr. Ward records another with eleven from the same range. Mr. Buxton also has a many-pointed specimen, although the palmation of the crown indicates that it is somewhat abnormal. In the Caucasus this deer is known as the ollen, and Mr. St. George Littledale¹ has published the following remarks regarding its characters and antlers. "When I hunted the ollen," he writes, "I had no notion that I should ever be called upon to carefully discriminate between them and their kin in other countries, so that I am obliged to rely upon my memory for any points of difference, and memory only suggests that whereas the wapiti rarely (if ever) has cups on his antlers, the ollen royal has the peculiar cup-formation as often as the red deer. Again, the call of the Caucasian stag in the rutting-season (September) is similar to that of the Scotch stag, and does not resemble the weird whistle of the wapiti. In size both of body and antler the ollen comes very near to the great American stag." With regard to the cupping of the antlers, the plate annexed to Mr. Littledale's note

¹ Badminton Library, *Big Game Shooting*, vol. i. p. 36.

shows seven heads of his shooting, but only two of these appear to show the perfect cup comparable to those of old continental examples of the typical red deer, and then only on one side. One of these heads is figured at the end of the present volume.

Antlers of this race from Asia Minor and the Crimea not unfrequently exhibit a great paucity of tines, with a corresponding development of the beam. In the *Proceedings* of the Zoological Society for the year 1890 I have given a figure¹ of an abnormal antler from Asia Minor doubtless belonging to this race, in which there is no tine above the brow till the crown, which is much expanded and bears a number of points. Another antler from the Crimea, represented in the same plate, consists merely of a beam with a couple of tines at the summit; and antlers of such abnormal type seem by no means uncommon in the Crimea and Asia Minor, although I have seen none precisely comparable from the habitat of the typical race.

In the summer of 1897 a herd of red deer from some part of the Caucasus or Transcaucasia was added to the collection at Woburn Abbey. It comprised a sub-adult stag and several hinds, all in summer pelage. The hinds were somewhat larger than ordinary red deer, and the stag had the long brow and short bez-tine which seem very characteristic of this race; all showing the long, slender, maral face. The coat in both sexes was distinctly red, marked with a large number of yellow spots; so much spotted, indeed, that these deer had almost the appearance of large sikas. Although a few spots may be seen on the back of some typical red deer hinds in the summer pelage, I have never seen any comparable in this respect to the Caucasian herd, neither have I ever seen the stags so spotted. Possibly the *C. elaphus varius* of Fitzinger is based on the Caspian race. The specimens are important in showing that the summer pelage of the hinds and young stags is reddish. In winter these deer turned very dark gray, becoming nearly black on the shoulders, thighs, and under-parts; they had a dark stripe down the middle of the back, and a dark patch in front of the caudal disk, which was bordered with black. This type of coloration, as well as the spots in summer, are stated by Fitzinger to be characteristic of all specimens not fully adult, but the blackness is well shown in the old stag in the British Museum; and Mr. Sclater tells me that he saw a spotted herd at St. Petersburg. Several of the Woburn specimens are shown in Figs. 1

¹ Plate xxx.

and 2, where they are the largest members of the groups. I have no information as to the summer colouring of Carpathian examples.

In its generally simpler antlers this race apparently forms a partial transition from the typical race in the direction of the three under-mentioned Asiatic species; and it is noteworthy that examples in which these appendages attain unusual complexity are recorded from the Carpathians and Caucasus, where this race must impinge very closely on the habitat of the typical red deer, with which it not improbably intergrades. The name "maral" being the Persian equivalent for deer in general, it is applied throughout a great portion of Asia to all the larger members of the genus. Hence much confusion as to what constitutes the true maral in the zoological sense of the word, the Altai wapiti being commonly designated by this term.

Distribution.—The typical locality of this race of the red deer is the Caspian provinces of Northern Persia, where it is the only representative of the present group of the genus, as it also is in the Crimea and probably in Asia Minor. Thence the range extends into Transcaucasia, the Caucasus, probably Circassia, and the Galician Carpathians. With regard to the Caucasus, Dr. Satunin speaks of the red deer as being common in many parts of that range and in Transcaucasia, but doubts if the "maral" occurs there, although he rightly says that the latter is the only stag in the Crimea. What distinction he finds between the Crimean and Caucasian deer I have no means of knowing, but both must apparently be referred to the present race, although the typical race may extend into the Northern Caucasus. The Carpathian deer are referred to the present race in Mr. Rowland Ward's book, and Mr. Buxton's specimens indicate the apparent correctness of this reference. His specimens, as already mentioned, are from the Galician or Eastern Carpathians, and information is urgently needed as to how far we have to travel westward along the range before entering the habitat of the typical red deer. Mr. Ward uses the name of Carpathian deer for the present animal, but this is obviously inadvisable, as Persia is its typical habitat, and in the Carpathians we may expect to find it intergrading with the western race. Information is also required with regard to the red deer of Turkey.

Some years ago Dr. A. Nehring¹ suggested that the large red deer antlers from the Plistocene deposits of Europe belonged to the maral, and it

¹ *SB. Ges. Nat. Berlin*, 1887, p. 67.

seems not improbable that the large fragments from Kent's Cavern, near Torquay, figured by the late Sir R. Owen under the name of *Strongyloceros spelæus*, may be referable to the same race. At a later date, however, Dr. Hans Pohlig¹ identified the latter form with Kaup's *C. primigenius*, which he regarded as indicating a race more nearly allied to the typical red deer. At the same time he described and figured certain antlers from the Middle Plistocene deposits of Thuringia, under the name of *C. elaphus antiqui*. One of the specimens figured in plate xxv of his memoir shows the short brow-tine and simple crown so frequently found in the maral, with which race I have little hesitation in identifying the extinct form. If the *C. primigenius* of Kaup be likewise identical, that name must supersede *C. maral*. The Plistocene red deer being of the maral type, the highly specialised antlers of the typical red deer are evidently a late western development which did not appear till about the date of the fen-deposits.

Habits.—Sir Victor Brooke writes that a pair of maral “which lived in one of my parks for some years, kept entirely apart from the red deer inhabiting the same park. They bred together; and during the rutting-season the two species never showed the faintest desire to cross. This was the more remarkable, as the old stag maral, though considerably larger in size, lived in great fear of the red deer stags, which during that season roamed incessantly through the park in search of hinds, but at all times treated the female maral with sovereign disdain, although at any time they could have taken possession of her had they so desired.”

The late Sir O. B. St. John, as quoted in Mr. Blanford's *Zoology and Geology of Persia*, wrote as follows:—“The maral is very numerous in the forests of the Caspian provinces, but does not occur elsewhere [in Persia]. It is often brought alive to Tehran, and, before the famine, the Shah's zoological gardens contained seven or eight specimens, which died of starvation or were killed and eaten by the keepers.” The roar of the stags in the Woburn herd, although not quite like that of the European race, has no wapiti element in its composition.

The following dimensions of antlers of this form are taken from Mr. Rowland Ward's book:—

¹ *Palæontographica*, vol. xxxix. p. 246 (1892). The recent Siberian skull figured on p. 254 as that of a maral belongs to one of the Asiatic wapitis.

NATIONAL MUSEUM NEW GOWANE



BEDFORD'S DEER IN SUMMER PELAGE.

Length on Outside Curve.	Basal Circumference.	Tip to Tip.	Maximum Width inside.	Number of Points.	Locality.
48 $\frac{1}{2}$	6	30	41 $\frac{1}{2}$	5-6	Crimea
48	7 $\frac{1}{4}$?	?	?	Caucasus
47 $\frac{5}{8}$	5 $\frac{1}{2}$	38	?	6-5	„
47	7 $\frac{1}{8}$	36	37 $\frac{3}{4}$	6-7	„
47	6 $\frac{3}{4}$	21 $\frac{3}{4}$	36 $\frac{3}{4}$	5-5	Crimea
46 $\frac{3}{4}$	5 $\frac{3}{8}$	18	33	8-8	Caucasus
45 $\frac{3}{4}$	7 $\frac{3}{4}$	25 $\frac{1}{8}$	35 $\frac{3}{8}$	8-8	„
45 $\frac{3}{8}$	5 $\frac{3}{4}$	42	35 $\frac{3}{8}$	6-7	Crimea
45	8	36	42	11-10	Caucasus
45 $\frac{1}{8}$	7 $\frac{3}{4}$?	?	9-6	Asia Minor
44 $\frac{3}{4}$	6 $\frac{1}{2}$	33 $\frac{3}{4}$	35 $\frac{1}{8}$	7-5	Caucasus

2. THE DUKE OF BEDFORD'S DEER—CERVUS XANTHOPYGUS

Cervus xanthopygus, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. viii. p. 376 (1867); *Rech. Mamm.* p. 181, plate xxi (1868-74); Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 590 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 68; Ward, *Records of Big Game*, p. 17 (1896).

Cervus bedfordianus, Lydekker, *Proc. Zool. Soc.* 1896, p. 932.

Plate III

Characters.—Size about the same as a large red deer. Antlers rounded, with the brow-tine greatly elongated, and about three times the length of the very short bez-tine, which is separated by a long interval from the former; five tines in those of the third year; the curvature of the beam regular; the fourth tine not greatly enlarged, and probably no cup formed at the crown. Tail shorter than in the red deer, and the caudal disk, when developed, relatively large. Summer pelage uniformly bright foxy red on the upper-parts and outer side of limbs; face, throat, and inner side of limbs bluish gray; in winter the upper-parts brownish gray, with a large bright orange caudal disk, the mane being blackish, with a considerable amount of black on the tips of the hairs. No white on muzzle.

This species was originally described on the evidence of a male from the Imperial gardens at Pekin, which appears to be an old animal with the antlers retrograding. In the figure the colour of the pelage is reddish, and there is a distinct orange caudal disk, with a dark front margin. From the

evidence of the next specimen, it would seem that the figure was taken just before the complete replacement of the summer by the winter coat, at which time the caudal disk makes its first appearance, apparently through fading of the original colour. The tail is represented as very long. The left antler has three, and the right four tines; the brow-tine in the latter being very long and the bez very short.

The second definitely known example is a young male from near Pekin, received at Woburn Abbey in the summer of 1896, and provisionally described as a distinct species under the name of *C. bedfordianus*. The antlers had four tines, with a distinct excess of the brow- over the bez-tine in length. At that time the pelage was short, smooth, and glossy, and of a bright foxy red colour, without the slightest trace of a light disk on the buttocks round the short tail. There was no throat-mane. By the middle of September, the summer coat was being replaced by the winter one. The most extraordinary change was the development of a large yellowish disk on the buttocks, including all the tail. This disk was clearly produced by a change in the colour of the hairs of the summer coat; but it appeared to be also developing in the winter coat. The general colour of the latter seemed to be bluish gray, or brown, with a tendency to fawn on the neck. A distinct fringe had also developed on the throat. This was very thin, with bands of black, and white tips to the hairs: thus being quite different from the thick, uniformly-coloured fringe of the wapiti. Still later, the general colour of the coat became more wapiti-like, and the caudal disk more distinct and brighter. By the middle of June 1897 the animal had again assumed its summer pelage, which was precisely similar to that of the previous year, thus proving that the absence of the light caudal disk was not a feature due to immaturity. The new antlers had acquired five points, and were remarkable for the excessive proportionate length of the brow-tine, which was nearly a foot long, whereas the bez-tine was not more than one-third the length. In the plate the animal is represented bearing these third antlers. In general form the antlers come nearest to those of the Caspian variety of the red deer. The animal, after a long period of ill-health, died in October 1897, and its head is now mounted in the British Museum.

The large brow- and small bez-tine of the antlers appear sufficient to justify the identification of the specimen in question with *C. xanthopygus*, in spite of the circumstance that the type of the latter is depicted with a

NATIONAL MUSEUM OF FOLK-ART



HANGUL.

tail of great relative length, which must accordingly be regarded as an error on the part of the artist.

The red colour and the absence of the caudal disk in the early summer pelage, as well as the simple antlers, are distinctly generalised characters, although the extremely short tail is a specialised feature sharply distinguishing this species from the red deer. The appearance of the caudal disk by fading of the summer pelage is paralleled by the bleaching of this area in the wapiti, and may indicate the original mode of formation.

Distribution.—Manchuria, and probably other parts of Eastern Asia. How far west this species extends, is a point for future investigation ; the range given by Sir Victor Brooke includes the areas of other species.

Habits.—Although nothing is known of this deer in a wild state, the specimen at Woburn Abbey lived almost entirely on leaves during the summer, whereas both red deer and wapiti are to a great extent grazing animals.

3. THE HANGUL—CERVUS CASHMIRIANUS

Cervus cashmerensis, Gray, *List Osteol. Brit. Mus.* p. 65 (1847),—no description.

Cervus cashmeriensis, Adams, *Proc. Zool. Soc.* 1858, p. 529.

Cervus cashmeerianus, Falconer's *Palæontological Memoirs*, vol. i. p. 576 (1868) ; Sclater, *Trans. Zool. Soc.* vol. vii. p. 339 (1871) ; Gray, *Cat. Ruminants Brit. Mus.* p. 68 (1872) ; Brooke, *Proc. Zool. Soc.* 1878, p. 912 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 184 (1891).

Cervus wallichii, Kinloch, *Large Game Shooting*, part i. p. 44 (1869).

Cervus cashmirianus, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 586 (1874) ; Sterndale, *Mamm. Ind.* p. 512 (1884) ; Blanford, *Fauna Brit. Ind.*—*Mamm.* p. 535 (1891) ; Ward, *Records of Big Game*, p. 38 (1896).

Plate IV

Characters.—Height from 4 feet to 4 feet 4 inches at the shoulder. Antlers rounded throughout, with a bez-tine, and usually only five points, so that no cup is formed at the crown ; the brow-tine generally arising at a considerable distance above the burr, and usually shorter than the bez ; and the fourth tine shorter than the fifth, or terminal tine ; the beam much curved towards the middle line, so that the summits of the terminal tines of the

opposite antlers are more or less closely approximated. Tail short, and the light caudal disk, at least frequently, very small, and not extending on to the upper surface of the buttocks, thus excluding the tail. Ear equal to half the head in length. Hair on back not reversed, and no white on the muzzle above the lips. Metatarsal tuft lower down than in the red deer. General colour of pelage in winter brown, brownish ash, or liver-colour,



FIG. 22.—Head of Hangul, from a Kashmir specimen. (Rowland Ward, *Records of Big Game*.)

with the individual hairs speckled ; the light area on the inner sides of the buttocks dirty white, with a dark line on its outer border running down the inner side of the thigh ; upper surface of tail black ; flanks and limbs paler than the back ; lips and chin white, and ears whitish internally. In summer, the general colour lighter and more rufous, with most of the under-parts whitish, although brown posteriorly in the male. Throat-fringe small and not markedly darker than the rest of the pelage. Spotting of fawn

stated to persist till the third or fourth year, instead of more or less completely disappearing during the first year, as in the typical race of the red deer. Cry of male in the breeding-season a loud prolonged squeal, like that of the wapiti.

Although differing by its short tail and the slight development of the rufous tinge in the summer pelage, this very well-marked species presents a decided approach to the sikas in the comparatively simple form of the antlers, the long persistence of the spots, and the, at least frequent, slight extent of the light caudal area, in which the dark marginal streak down the thigh is precisely similar to the sikine type. The distance by which the brow-tine is separated from the burr does not seem to have been previously noticed as a point of distinction between this species and the red deer, although it is a very marked one, the interval being sometimes fully an inch and a half in length.

Distribution.—Kashmir and Yarkand.

a. KASHMIR RACE—CERVUS CASHMIRIANUS TYPICUS

Characters.—The terminal or fifth tines of the antlers so much curved inwards as to be separated only by a very small interval. The coloration of the pelage is that described above.

Further information is required as to the degree of development of the light caudal disk. Mr. Blanford, who apparently describes it as well developed, writes as follows :—“In Sclater’s figure, from an animal in the Zoological Gardens, there is no caudal disk; the tail is dark brown above, pale below, and only the buttocks pale rufous. Whether this is due to variation in colouring or to age, it is impossible to say, but a skin from the Zoological Gardens, now in the British Museum, agrees with the figure.” It is this skin which forms the subject of plate iv. In the original description given on page 577 of the first volume of Falconer’s *Palæontological Memoirs* the following words are used, viz. :—“Hind aspect of the buttocks marked by a very well-defined patch of white, running up to and terminating at the angle of junction of the tail, and pursuing down on the inside of the buttocks towards the thighs; no disk of white on the rump.” As this description accords precisely with the two specimens noticed above, it is evident that the slight development of the light caudal

area is at least a very frequent characteristic of the species. It may be added that the passage quoted refers to a female, but on page 576 of the same work the absence of a caudal disk is also noted in the male, of which several examples are described.

The following are the dimensions of some of the largest antlers recorded by Mr. Rowland Ward :—

Length on Outside Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.
48	?	?	?	?
47	?	?	?	?
47	$7\frac{5}{8}$	21	36	7-5
47	$6\frac{1}{4}$	30	$35\frac{1}{8}$	8-8
$45\frac{7}{8}$	8	35	41	6-6
$45\frac{5}{8}$	6	$25\frac{3}{4}$	36	8-8
45	$6\frac{3}{7}$	19	34	6-6
$44\frac{3}{4}$	7	20	43	5-5
$44\frac{5}{8}$	$8\frac{1}{2}$	$31\frac{1}{2}$	$44\frac{3}{4}$	5-5
44	$7\frac{1}{4}$	$30\frac{3}{4}$	$40\frac{7}{8}$	5-5
44	6	27	36	5-5

Colonel J. G. Allan sends me the following dimensions of a remarkably symmetrical pair of antlers, with six tines on each side, shot by himself in Kashmir. Outside length of right antler 45 inches, of left $44\frac{1}{4}$; extreme inside width, 37; outside span, 42; maximum distance between points, 52 inches.

Distribution.—The valley of Kashmir and some of the neighbouring valleys, such as Maru-Wardwan, Kishtwar, Badrawar, and Tilel; westward limits unknown. In summer hangul are found at elevations of from 9000 to 12,000 feet, but in winter descend to the level of the Walar Lake, at about 5000 feet above the sea.

Habits.—After stating that by the end of March all the old stags and most of the young ones have shed their antlers, Colonel R. J. Percy¹ writes as follows concerning the migrations of the hangul :—“The deer collect into large herds and begin moving off to their summer quarters, those in the western corner of the valley (of Kashmir) going to the banks

¹ Badminton Library, *Big Game Shooting*, vol. ii. p. 277. Some emendations in the spelling of place-names are made in the quotation.

of the Kishanganga river (Tilel). The herds which strike the river at its nearest point below Gurez cross it, and retire to the range of hills on the southern border of Astor. Only a very few stags cross this range, the bulk of the deer remaining on the Kashmir side. The deer on the northern and eastern sides of the valley retire to the slopes of Haramuk and the high ground south of the range which separates Kashmir from Dras and Suru, but do not appear to cross it. The farther east one goes from Srinagar the less the deer appear to migrate, merely retiring to the heads of the valleys. The altitude of the birch copses just above the limit of the pines is what they seek, and this they can find close at hand on the north and east of the valley, but they have to travel some distance to it on the west." None are found on the Pir Panjal range, forming the southern barrier of the Kashmir valley.

In June I have seen hangul close to the summit of the Zogi-la, the pass between Kashmir and Dras, at an elevation of 11,000 feet ; but by the time the antlers are free from velvet they descend to much lower levels. By September the antlers of the stags are clean, and about the 20th of that month calling begins, although the date of its commencement depends somewhat upon the season and the weather. Although the older writers on Himalayan sport, like Colonel Markham, speak of hangul calling throughout the day, at the present time they only do so in the mornings and evenings, commencing in the late afternoon. During the calling-season stags may frequently be seen escorting a party of hinds into the open glades between the patches of forest, and it is then that the sportsman finds his best opportunity. These deer seem by no means to confine themselves to a single forest, but are much given to wander from one belt to another. The calling-season generally ends by the latter part of October, after which the stags are exceedingly difficult to find, until the snow drives them down to the open country of the Kashmir valley. The fawns are born in April.

Although the term Barasingha (12-tined), or occasionally Burrasingha (big-horned), is applied to these deer by Kashmiri shikaris, they never use it when conversing among themselves ; and it has been imported from the plains of India, where it properly belongs to the swamp-deer.

b. YARKAND RACE—*CERVUS CASHMIRIANUS YARCANDENSIS*

Cervus cashmirianus yarkandensis, Blanford, *Proc. Zool. Soc.* 1892, p. 117.

Cervus yarkandensis, Blanford, *op. cit.* 1893, p. 447.

Cervus yarcandensis, Lydekker, *ibid.* 1896, p. 933.

Characters.—The antlers less spreading, with their terminal (fifth) tines less inclined inwards, and therefore separated by a wider interval than in the typical race. The pelage is stated to be generally pale-coloured, with a well-marked caudal disk. Several skulls in the British Museum show the normal five tines, but in one specimen presented by Mr. H. Leonard an extra tine is developed on the crown of each side so as to form an imperfect cup.

In his original description Mr. Blanford was careful to state that the name *yarkandensis* was to be used in a sub-specific sense, and that this form must not be regarded as specifically distinct from the Kashmir stag. In the type specimen the two antlers are respectively 35 and 34 inches in length, measured along the beam and round the curves, the basal circumference above the burr being $6\frac{3}{4}$ inches.

Distribution.—Eastern Turkestan, in the woods on the Yarkand or Tarim river.

I have not met with any account of the habits of this deer, which are probably, however, very similar to those of the Kashmir race.

4. THE SHOU—*CERVUS AFFINIS*

(?) *Cervus wallichii*, Cuvier, *Ossements Fossiles*, ed. 4, vol. vi. p. 89 (1835).

Cervus affinis, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 721 (1841); Sclater, *Trans. Zool. Soc.* vol. vii. p. 343 (1871); Brooke, *Proc. Zool. Soc.* 1878, p. 913; Sterndale, *Mamm. Ind.* p. 514 (1884); W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 184 (1891); Blanford, *Fauna Brit. Ind.*—*Mamm.* p. 537 (1891); Ward, *Records of Big Game*, p. 41 (1896).

(?) *Pseudocervus wallichii*, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 904 (1841); Gray, *List Mamm. Brit. Mus.* p. 180 (1843).

Characters.—Size probably equal to that of the wapiti. Antlers of the

general type of those of the hangul, but larger, and with the beam bent suddenly forwards at the trez (third) tine, so that its upper half overhangs to a great extent the face ; number of points usually five, the brow-tine less constantly longer than the bez, and separated by a shorter interval from the burr, than is the case in the hangul. With regard to coloration, which Mr. Blanford states resembles that of *C. cashmirianus*, with the caudal disk well marked, more information is required. In a mounted head in the



FIG. 23.—Front view of Skull and Antlers of Shou. From a specimen in the British Museum.
(Rowland Ward, *Records of Big Game*.)

British Museum the colour is pale rufous brown ; and this is the colour of the entire body, including the buttocks in the coloured figure of a stag in Brian Hodgson's sketches. A second sketch, representing a stag and hind, in the same series, shows, however, the colour darker and a large white caudal disk ; this being probably the winter coat. In the aforesaid mounted specimen the ear is not more than one-third the length of the head, and is not distinctly white internally, but it appears longer in the sketches, and its small size in the stuffed head may be due to shrinking.

In one of the two sketches the tail is relatively long, whereas in the other it is comparatively short.

The following dimensions of antlers of this species are taken from Mr. Rowland Ward's book; the first two in his list being omitted, as it is doubtful whether they are rightly named.

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Greatest Width inside.
$54\frac{3}{8}$	$6\frac{5}{8}$	$21\frac{5}{8}$	$37\frac{1}{2}$
$53\frac{3}{4}$	$6\frac{7}{8}$	$26\frac{1}{2}$	44
$53\frac{1}{4}$	$6\frac{7}{8}$	30	$45\frac{3}{4}$
53	9	?	40
52	8	?	?
$49\frac{1}{2}$	$7\frac{1}{2}$	38	$45\frac{1}{2}$
$48\frac{7}{8}$	$6\frac{1}{2}$	$19\frac{3}{8}$	$38\frac{1}{8}$
$47\frac{7}{8}$	$5\frac{5}{8}$	$20\frac{1}{8}$	$40\frac{1}{2}$
$43\frac{3}{4}$	$5\frac{7}{8}$	$23\frac{5}{8}$	35

With the exception of three, all the specimens in this series have five points on each side; in the exceptions, one antler in each has five points, while on the opposite side the number of points is respectively four, six, and seven.

Distribution.—Apparently the district lying to the north of Bhutan, and probably the valley lying to the east of the Chumbi valley, and draining northwards into the valley of the Sangpo.

Information is urgently required as to the coloration and habits of this magnificent deer, which has never been exhibited alive in any European menagerie, if, indeed, it has been seen alive by European eyes. Brian Hodgson had, however, either a skin or a specimen in the flesh, and it is possible that a deer formerly living in the Viceregal menagerie at Barrackpore, near Calcutta, may have belonged to the species. With regard to the scientific name adopted for this species, the words of Mr. Blanford may be quoted, which are as follows:—"The animal to the figure of which, by Duvaucel, Cuvier gave the name of *C. wallichii* lived in the Barrackpore menagerie, and was said to have been brought from Muktinath, near Mount Dwalagiri in Nepal. This place is as nearly as possible half-way between the localities inhabited by *C. cashmirianus* and *C. affinis* respectively. It is difficult to believe that any large deer living in

NATIONAL MUSEUM OF THE UNITED STATES



THOROLD'S DEER.

Northern Nepal could have escaped the knowledge of Hodgson's collectors. The shed horns of the type specimen of *C. wallichii* are preserved in Calcutta, and have been figured ; they are probably, according to Mr. W. L. Slater, of the third year, but whether they agree better with those of *C. cashmirianus*, or *C. affinis*, of the stag of Eastern Turkestan, or of any other species, is undecided."

There is, therefore, a great probability that what *Cervus wallichii* really was will never be determined, although I have a suspicion that it was the same as the present species. If this prove to be the case, the name *affinis* will have to be superseded.

5. THOROLD'S DEER—CERVUS ALBIROSTRIS

Cervus albirostris, Prezewalski, *Catalogue of Zoological Collections of H. M. Prezewalski*, p. 16, no. 36 (St. Petersburg, 1887).

Cervus dybowskii, W. L. Slater, *Journ. As. Soc. Bengal*, vol. lviii. p. 186 (1889), *nee* Taczanowski, 1876.

Cervus thoroldi, Blanford, *Proc. Zool. Soc.* 1893, p. 444.

(?) *Cervus nariyanus*, Hodgson, *Journ. As. Soc. Bengal*, vol. xx. p. 292 (1851) ; see Blanford, *op. cit.* p. 447.

Plate I

Characters.—Size approximately the same as that of the hangul. Antlers much flattened, with no bez (second) tine, and five or four points, the brow-tine arising a considerable distance above the burr, the trez nearly in the same plane with the tines above it, and the succeeding tine (third in this species, but representing the fourth in those with the bez developed) longer than either of the others ; the beam suddenly bent back at the origin of the trez-tine. Tail short, and the caudal disk of moderate size and embracing the whole tail. Ear half as long as the head. Hair on middle of back reversed, so as to be directed forwards towards the neck, and the muzzle, chin, and lips white. General colour of pelage (season unknown) uniformly dark brown, with the hairs minutely speckled, and scarcely paler on the under-parts than above ; caudal disk pale ochry buff, without any white below the tail ; inner surface of ears whitish, and, as already said, pure white on the muzzle, lips, and chin. Metatarsal tuft very coarse, and situated nearly in the middle of the cannon-bone.

The hairs on the body differ from those of other species of the genus in their coarseness and pithy interior, thus somewhat resembling those of the musk-deer. Possibly this structure is a provision against extreme cold. Each hair is long, with the greater portion brown, but the base buff, and the tip whitish, thus communicating the speckled appearance to the whole pelage. The light tips are, however, wanting on the margin of the caudal disk, thus forming, as in the hangul, the blackish border to this area. The reversal of the hairs on the middle line of the back extends from the hips to the withers, where it ceases abruptly in a kind of hump.

Compared with other members of the group, the skull is relatively short; and the muzzle is also exceptionally short and broad. In several other structural details the skull also shows an approximation to the sikine type; but its most remarkable peculiarity is the great expansion of the nasal bones a short distance below their upper extremities, this being so great as almost to obliterate the lachrymal vacuity, which is consequently much narrower than in other members of the group. In this respect the species approximates to some of the smaller members of the sambar group.

In regard to the affinity of this deer, Mr. Blanford remarks that it does not come very close to any other species, although its relations are probably on the whole nearer to *C. cashmirianus* and *C. affinis* than to any other. He also remarks on certain wapiti-like characters in the antlers. But these antlers—especially when they have only four points—appear to me in their general flatness, and also in the absence of the bez-tine, to present a decided resemblance to those of the sikas, towards which the species also approximates in the relative shortness of the skull. And it seems not improbable that this form may indicate the line of descent of the wapiti from the sikine group, while the hangul may mark the evolution of the red deer from the same stock.

Distribution.—The two specimens forming the types of *C. thoroldi* were shot by Dr. W. G. Thorold during his journey across Tibet at a spot about 200 miles to the north-east of Lhasa, at an approximate elevation of 13,500 feet above the sea-level, in the snow among brushwood just above the forest. The head and antlers of a third specimen had been previously purchased by Mr. W. L. Sclater in the bazaar at Darjiling, and provisionally assigned by him to the sikine group, under the name of *Cervus dybowskii*. At a still earlier date specimens had been obtained from some part of Central Asia

by Col. H. M. Prezewalski, and named *C. albirostris*, and since this name is accompanied by a brief description, in Russian, and also by photographs clearly showing the characteristic white muzzle, it is entitled to supersede the one given by Mr. Blanford.

With regard to the antler described by Hodgson under the name of *C. nariyanus*, which Mr. Blanford considers may have belonged to a young individual of the present species, that writer's own words may be quoted. "This horn," he writes, "was said to have been brought from Ladak, it was 34 inches in length, and had four points, the two lower being more than 4 inches apart, so that there was no bez-tine. Judging by the figure, the horn was more massive than would be expected in a young specimen of Thorold's stag. Mr. Hodgson remarked that the Bhotiahs who brought this horn say it belonged to a very young animal, and that the species, which is proper to Gnari, in Western Tibet, is larger than the shou. The stag obtained by Dr. Thorold is considerably smaller than the shou ; there is, so far as is known, no stag in Western Tibet, *C. cashmirianus* being limited to the Kashmir valley, at all events to the north and east of its range, and, as is well known, young examples of *C. elaphus*, and I believe of the wapiti also, frequently want the bez-tine ; so that it is by no means impossible the Ladak horn may have belonged to a young *C. cashmirianus* from Kashmir, to *C. yarkandensis* from Eastern Turkestan, or even to *C. eustephanus* (*C. canadensis*, var.) from the Thian Shan, Ladak being connected with all those regions by trade routes. The Bhotiah story was probably pure fiction.

"There is, moreover, one very strong reason for not using the name *nariyanus* for the present animal, even if, as is highly probable, it was the species that furnished the horn described and figured by Hodgson. The name was taken from Nari, the western (or rather perhaps the southwestern) province of Tibet, often called Gnari or Nari-Khorsum, a tract, as represented on maps, of no great breadth from north to south, but extending along the north of the Himalayas from the western extremity of Tibet proper, near Rudok, and between long. 80° and 85° E. This region, part of which is known as Hundes, is on the frontier of our own territory, and has been visited at several points by British sportsmen. If any stag inhabited the region, it is incredible that nothing should have been heard of it ; moreover, the whole of the upper valleys of the Sutlej and Yarot-

sanpo, or Brahmaputra, of which the area consists, is a barren, treeless, almost bushless waste, differing essentially from the country inhabited, so far as is known, by any species of *Cervus*. I think it extremely improbable that any stag inhabits Nari; and under these circumstances it is not desirable to apply the name of *nariyanus* to a species which does not occur there."

With this conclusion I fully agree, although I believe it would not be accepted by all zoological writers. So far as English literature is concerned, nothing appears to have been recorded regarding the habits of this very distinct species of deer.

6. THE WAPITI—*CERVUS CANADENSIS*

Cervus elaphus canadensis, Erxleben, *Syst. Regn. Animal.* p. 305 (1777).

Cervus wapiti, Barton, *Philadelphia Med. and Phys. Journ.* vol. iii. part i. suppl. p. 36 (1808); Leach, *Journ. Physique*, vol. lxxxv. p. 67 (1817).

Cervus major, Ord, in Guthrie's *Geography*, p. 292 (1815).

Cervus canadensis, Desmarest, *Mammalogie*, vol. ii. p. 433 (1822); Baird, *N. Amer. Mamm.* p. 638 (1857); Sclater, *Trans. Zool. Soc.* vol. vii. p. 342 (1871); Gray, *Cat. Ruminants Brit. Mus.* p. 68 (1872); Caton, *Antelope and Deer of America*, p. 77 (1877); Brooke, *Proc. Zool. Soc.* 1878, p. 913; Merriam, *Mammals of Adirondacks*, p. 143 (1884); Merrick, *Mammals of Minnesota*, p. 278 (1892); Ward, *Records of Big Game*, p. 33 (1896); Rhoads, *Proc. Ac. Philadelphia*, 1897, p. 207.

Cervus (Elaphus) canadensis, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 96, v. p. 308 (1827).

Cervus strongyloceros, Richardson, *Fauna Bor. Amer.* p. 251 (1829); Gray, *Knowsley Menagerie*, plate xxxvi (1850).

Elaphus canadensis, De Kay, *Zool. N. York*, vol. i. p. 118 (1842).

Cervus (Strongyloceros) canadensis, Gray, *Knowsley Menagerie*, p. 58 (1850), *Cat. Ungulata Brit. Mus.* p. 193 (1852).

Strongyloceros canadensis, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 350 (1873), lxix. part i. p. 556 (1874).

Characters.—Height reaching to 5 feet 4 inches at the shoulder. Antlers very large, with more than five tines, curving backwards, and much flattened in the upper half; the bez-tine present, the fourth tine longer than all the others, and with the fifth, which is also long, forming a nearly

symmetrical fork, the fourth, fifth, and sixth being situated nearly in the same plane as the portion of the beam immediately below them, so as more



FIG. 24.--Head of East American Wapiti. From a specimen in the possession of Mr. W. Moncreiffe.
Length of antlers on outside curve 58, basal circumference $7\frac{3}{8}$, greatest width inside 49 inches.

or less nearly to occlude one another when viewed from the front ; the brow-tine rising close to the brow, and approximately equal in length to

the bez ; the crown normally not cupped. Caudal disk larger than in any other species ; throat-fringe greatly developed ; neck and under-parts dark coloured ; no white on the muzzle, and no reversal of the hair of the back. Tail very short ; ear about half the length of the head ; face rather short. General colour of summer coat on upper-parts yellowish brown, sometimes with a reddish tinge ; neck and under-parts varying from dark brown to blackish ; limbs generally chestnut-brown. Cry of male in the pairing-season typically a loud squeal, ending in a more guttural tone.

Distribution.—North America and Central and North-Eastern Asia.

a. EAST AMERICAN RACE—*CERVUS CANADENSIS TYPICUS*

Cervus canadensis verus, Blyth, *Proc. Zool. Soc.* 1865, p. 618.

Characters.—The typical, or East American, race of this fine and distinct species is a rather short-legged and heavily-built animal, standing about 5 feet 4 inches (16 hands) at the shoulder, and weighing from 700 to 1000 lbs. The antlers are not excessively large in proportion to the general size, and there is usually a distinct reddish tinge in the early summer pelage, although later on in the season this fades to a dirty yellow tawny. The general coloration has been admirably described by Mr. Caton, who observes that the summer coat is of a dirty yellowish white colour on the body, and chestnut-brown on the legs, neck, and head ; the males and females being almost alike. When this coat first appears in June, upon the peeling off of the old winter dress, it is of a deeper shade and more glossy than at any other season of the year, and is the most beautiful dress the animal ever wears. It is exceedingly short, fine, and soft, and fairly glistens in the bright spring sunshine. In September this coat gives place to the winter dress, but the change is so gradual as to require the closest scrutiny to detect it, although the new coat differs very materially from the old in some parts. When the winter dress has been fully assumed, a marked difference is noticeable in the coloration of the males and females when the darker shades prevail. In the former the neck, legs, and under-parts are brownish black, and the dark border on the lower part of the light caudal patch deep black. On the other hand, in the female, the head, neck, legs, and under-parts are chestnut-brown, although the middle line of the latter is nearly black. The caudal disk is straw-coloured.

With regard to this light caudal disk, the same writer observes that it “commences at the top of the hip and extends back so as to embrace the tail ; its outer border descends laterally in a circular form, so that when even with the root of the tail, above that member, it nearly describes a semi-circle ; thence the outer border descends down the ham, gradually drawing inwardly, and contracting the white section, which, however, descends to unite with the lighter shades of the inguinal region. This white portion is bordered by an intensely black stripe, which commences on either side



FIG. 25. East American Wapiti. From a male at Woburn Abbey.
Photographed by the Duchess of Bedford.

above the region of the tail and continues down to the posterior sides of the thighs, where it fades out and is lost. The black mark appears on all animals of all ages and both sexes, but is the most brilliant on the male in the prime of life and in the fall of the year.” When the summer coat is first assumed, the light caudal disk is straw-coloured, but it gradually fades till in the latter part of the summer it becomes nearly white. Fading also takes place in the winter pelage, which gradually bleaches from the tawny yellow of autumn to a pale dirty white in winter, although there is much individual variation in this respect, scarcely any two animals in a herd being of exactly the same tint.

Although from six to eight tines is the normal number in American wapiti antlers, not unfrequently additional tines are developed in the region of the crown, which may then form a cup with more or less extensive palmation. Such a palmated head is figured on page 414 of the first volume on *Big Game Shooting* in the "Badminton Library."

The following dimensions of antlers of both races of American wapiti are taken from Mr. Rowland Ward's *Records of Big Game*, an abnormal specimen heading the list being omitted:—

Length along Outside of Curve.	Circumference above Bez-tine.	Tip to Tip.	Widest inside.	Number of Points.	Locality.
65	$7\frac{5}{8}$?	48	7-7	Wyoming
$64\frac{1}{4}$	8	?	48	7-7	"
$63\frac{3}{4}$	$8\frac{1}{4}$	$49\frac{1}{4}$	$48\frac{1}{2}$	7-7	?
62	$7\frac{3}{8}$	$33\frac{1}{4}$	$50\frac{5}{8}$	7-7	Colorado
$61\frac{1}{2}$	$7\frac{1}{2}$?	45	6-7	Wyoming
$60\frac{3}{4}$	$7\frac{7}{8}$?	52	6-6	Rocky Mountains
$60\frac{3}{8}$	$7\frac{1}{4}$	43	$46\frac{1}{4}$	6-6	Wyoming
$60\frac{1}{2}$	$8\frac{1}{4}$?	55	7-6	"
$59\frac{3}{4}$?	?	?	?	"
$59\frac{1}{2}$	$8\frac{1}{2}$	$37\frac{1}{4}$	47	8-7	Nebraska
$59\frac{1}{2}$	$7\frac{1}{2}$?	45	6-6	Wyoming
$58\frac{3}{4}$	$7\frac{3}{4}$	$36\frac{1}{4}$	47	9-8	"
$58\frac{1}{2}$	9	?	$46\frac{1}{2}$	10-7	"
$58\frac{1}{2}$	$8\frac{1}{2}$?	$44\frac{1}{2}$	6-6	"
$57\frac{1}{2}$	$6\frac{7}{8}$	$24\frac{1}{4}$	$35\frac{5}{8}$	6-6	Montana
$57\frac{3}{8}$	7	47	$48\frac{5}{8}$	6-6	Wyoming
$57\frac{1}{4}$	$9\frac{5}{8}$	32	$42\frac{1}{4}$	7-7	"
57	$7\frac{7}{8}$	61	49	8-8	"

Distribution.—North America, east of the Rocky Mountains, from latitude 57° N. in the interior of the continent through Labrador, the Alleghany region of Pennsylvania and Virginia, Northern Wisconsin, Minnesota, Dakota, Nebraska, Wyoming, and Montana. From the Adirondack region of New York the typical wapiti has long since been exterminated, the only remaining evidence of its former presence there being buried antlers. Regarding its range in the South-Eastern United States, Mr. Rhoads writes as follows¹:—"The former range of this animal in Pennsylvania was closely

¹ To avoid confusion, the names wapiti and bison are substituted in the extract for elk and buffalo.

coextensive with that of the bison, both species using the same trails, feeding-grounds, and licks among the Western Alleghanies, and passing thence eastwards by the same routes to the Delaware valley. The wapiti was most numerous among the elevated mountain glades and eastern tributaries of the Alleghany and Monongahela rivers. It was also fairly abundant in the early part of the century in Clinton, Potter, Tioga, and Lycoming counties. The range of the wapiti and bison into the south central counties of Pennsylvania, east of Fulton county, is very improbable, if, indeed, they ever wandered so far. The main line of their eastern range was probably along the valley of Castleman's River in Somerset county and the main ridge of the Alleghany Mountains near that place, which formed a continuous trail of safety between their haunts in West Virginia and the Keystone State. North of this region their range probably spread north-eastward as far south as the Juniata valley, but by far the greatest number did not come south of the east and west branches of the Susquehanna. The presence of an Elk Mills and Elk Creek in Chester county, and of an Elkton in Cecil county, Maryland, would indicate their former presence in that vicinity, probably only as stragglers along the Susquehanna valley."

Incessant persecution is telling on the numbers of both the American races of the wapiti very severely, although it may be hoped the day is far distant when they will meet the fate which has already befallen the bison. East of the Mississippi there is said to be only a single locality where they exist in the wild state; and although some are reported to remain in the forests of Lower Michigan, their days are probably numbered. At present to the westward of the Missouri, in the more remote districts of Montana, Wyoming, and Colorado, as well as in the Rocky Mountains, there are localities where the wapiti is still fairly abundant, yet its numbers are now to be reckoned by hundreds, instead of by thousands, as in the olden days.

Habits.—By an unfortunate misapplication of terms, the wapiti is very generally known in America as the elk; and the reader of American sporting works must consequently be on his guard against confusing the animal under consideration with the one to which the latter title pertains.

The accounts of the habits of the wapiti, both from the point of view of the sportsman and of the naturalist, are numerous, although the majority are based on the excellent description given by Mr. Caton, from which the following observations are in great part condensed. As regards food, these

deer are very promiscuous, consuming alike grass, rank herbage of various kinds, and the leaves of deciduous trees ; while in winter scarcely any kind of vegetable matter comes amiss. Leaves and twigs seem, however, to afford decidedly the most favourite nutriment ; and among the Woburn herd the hinds, at least, can always be attracted to the fence of their paddock by offering them leafy boughs. Gregarious at all times, the stags keep more or less separate from the hinds at the season when the fawns are born, which is during May and June. At this time even the hinds scatter, the stags collecting in small parties by themselves ; the latter, when in mountain districts, ascending to within a short distance of the snow-line. With the commencement of August the scattered groups begin to collect, and as September draws nigh, when the pairing-season is at its height, the old stags gradually collect around them a party of hinds, from which the smaller males are, so far as possible, driven away. The latter, however, hover about in the vicinity of the party, and seize every opportunity of drawing a straggling hind away from her allegiance. During this season the old stags are continually roaring ; and the roar must be heard to be fully realised, as no description will give any adequate idea of its peculiar sound. Still it may be described with considerable approach to accuracy as a kind of squeal, ending up with several hoarse, guttural grunts. During the time that the old stag has his harem with him, he treats its various members badly, always endeavouring to wrest from them the choicest food, and enforcing his claim with his antlers. Although in a wild state wapiti are stated to be prevented by their natural timidity from attacking any but the members of their own kind, in confinement old stags are vicious during the pairing-season, and rush at all persons approaching their enclosure.

After the pairing-season wapiti collect in large herds, which used formerly to number several hundred individuals, and wander about for a time till they finally select their winter feeding-grounds. These are usually open hills where the ground is kept more or less free of snow by the wind, so that such food as there is at this season may be obtained with the least difficulty. During the hot weather, when they are much persecuted by flies and mosquitoes, wapiti resort to water, in which they will stand for hours ; and, in the pairing-season at least, the old stags are fond of wallowing in mud-holes, from which they emerge coated with dirt, and presenting anything but a prepossessing appearance. The antlers are shed in March,

and the new pair free from velvet by the end of August or beginning of September. Saplings of aspen or pine appear to afford the favourite rubbing-posts for freeing the antlers from the last remnants of the velvet.

In the wild state the hind breeds when two or three years old ; the number of fawns at a birth being sometimes two, or rarely three, although one is the most common. The beautifully spotted fawns are very active, but it is some little time after their birth that the hinds rejoin the herd. In defence of her offspring the female wapiti displays great boldness and energy ; her great aversion, when in captivity, being a dog, in the pursuit of which the whole herd will join. Like that of the elk, the favourite pace of the wapiti is a long slinging trot, which can be maintained for a great length of time without apparent fatigue ; when forced into a gallop the animal is soon tired.

Although the ferocity of the old stags during the pairing-season makes them undesirable occupants of an open park, wapiti are easily domesticated, and thrive well in the English climate. They cross readily with the Asiatic wapitis, and also with the red deer ; and there is no doubt that a cross of wapiti blood improves the stamina and size of the latter when there has been a long course of in-and-in breeding. For magnificence of appearance, no deer can compare with the various races of wapiti as inhabitants of a park. In America Mr. Herrick states that he has seen wapiti employed with success for draught purposes.

b. WEST AMERICAN RACE—CERVUS CANADENSIS OCCIDENTALIS

Cervus (*Elaphus*) *occidentalis*, H. Smith,¹ in Griffith's *Animal Kingdom*, vol. iv. p. 101, v. p. 308 (1827).

Elaphus occidentalis, Swainson, *Classif. Quadrupeds*, p. 292 (1835).

Cervus occidentalis, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 139 (1835).

Cervus canadensis occidentalis, Blyth, *Proc. Zool. Soc.* 1865, p. 618.

Strongyloceros occidentalis, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 563 (1874).

Cervus roosevelti, Merriam, *Proc. Soc. Washington*, vol. xi. p. 272 (1897).

¹ In the original description the tail is stated to be long, and there appears to be some confusion with the mule-deer. But the antlers, which are clearly those of a wapiti, are first mentioned, and stand as the type. Blyth's acceptance in 1865 of the name confirms the identification of the sub-species.

Characters. Very close to the preceding, but longer-legged and more lightly built, with the portion of the antlers above the fourth tine aborted, and the colour very dark.

Specimens of this race are needed in England for comparison with the typical one. Hamilton Smith, who is confirmed by Blyth, stated that there were important differences in the antlers; and the former writer refers to two pairs of antlers in the British Museum which are said to agree with the specimens he saw in America, and to differ from those of the eastern race by the bez-tine exceeding the brow in length. A male from Oregon was living in the London Zoological Gardens in 1863, and, from his recollection of this specimen, Mr. Thompson, the head-keeper, informs me that it was much longer in the leg, slighter in the body, and altogether a more elegant-looking animal than the eastern race. If this be so, it approximates to the Manchurian race, which is just what would be expected on distributional grounds. The antlers, according to Dr. Merriam's description, also approximate to those of the latter.

Distribution.—America, west of the Rocky Mountains, extending from British Columbia and Vancouver Island through Washington, Oregon, and Northern California to North-Western Mexico. From British Columbia it is now apparently exterminated, although some remain in Vancouver Island. Its numbers in Oregon are alluded to under the head of the preceding race.

c. MANCHURIAN RACE—*CERVUS CANADENSIS LUEHDORFI*

Cervus luehdorfi, Bolau, *Abh. Ver. Hamburg*, vol. vii. p. 33 (1880); Fitzinger, *SB. Ak. Wien*, vol. lxxxiii. p. 373 (1881).

Cervus luehdorfi, Sclater, *List Anim. Zool. Gardens*, p. 263 (1883).

Cervus isubra, Noack, *Humboldt*, vol. viii. p. 6, fig. 5 (1889).

Characters.—Apparently very closely allied to the West American wapiti, although perhaps not attaining quite such large dimensions. Two hinds from Manchuria living in the menagerie at Woburn Abbey in 1896-97 were decidedly larger than those of the Altai wapiti, and also relatively more long-legged animals, and this difference affords one of the reasons for regarding the present form as sub-specifically distinct from the latter, although in the annexed description the Manchurian wapiti is said to be smaller than the (? typical) American race. The summer pelage (as shown

by the hinds at Woburn Abbey) is distinctly red, brighter even than in the red deer, while the winter coat is tawny yellow, of a different tint from that of the East American race. No trace of red is observable in the Altai wapiti.

The type specimens of *Cervus luehdorfi*, which comprised two pairs, were obtained from Transbaikalia, and were probably brought from the Bureatish Steppe of Northern Manchuria by nomads. The original description runs as follows : —“The Isubra deer,” as it is called, “is intermediate in height



FIG. 26.—Manchurian Wapiti Hind at Woburn Abbey. Photographed by the Duchess of Bedford.

between the European red deer (*C. elaphus*) and the North American wapiti (*C. canadensis*). In size it is closer to the former, in the shape of the antlers to the latter. Its hair is in winter brownish gray, in summer light brown ; the throat has a small whitish median streak ; the under lip is whitish, with three black spots, one small one in the middle, and two larger ones on each side. The strong mane is like that of the wapiti—in colour dark chestnut-brown, in places almost black ; in summer it disappears almost completely. The eye is smaller than in the red deer. The tail is much shorter than in either the red deer or the wapiti ; in the male it is only two-thirds of the

absolute length of that of the red deer ; relatively it is much shorter, as the Isubra deer is larger. The caudal disk is very strongly marked, extending, as in the wapiti, largely over the base of the tail. In the male it is foxy, but in the other specimens bright straw-yellow. A dark band, extending inferiorly on to the thigh, borders the disk. In both sexes the head is elongated, and the nose somewhat convex. A pair of antlers sent from East Siberia have two forwardly projecting brow-tines and a middle tine. While the beam goes in a regular curve to end in a terminal tine, there is given off a strong hind-tine, which is likewise single. Wherever tines are given off, the antlers are flattened, and resemble those of *C. eustephanus*, as figured by Blanford." It is added that the young are spotted. Antlers figured in the original paper show two well-developed tines above the fourth tine, but in a pair belonging to the Duke of Bedford this portion is aborted, as in the West American race.

Distribution.—Manchuria and Amurland, that is to say, the forest districts lying to the eastward of the Mongolian desert. If, as seems evident from the two hinds at Woburn, this form comes nearer in build and stature to the West American wapiti than does the Altai wapiti, it accords exactly with what would have been expected from its geographical distribution.

The name *Cervus isubra* seems to have been given in error by Herr Noack, as it is stated to be the title assigned to the species by Herr Bolau, who is the founder of the name *C. luehdorfi*.

Habits.—The little that is known regarding the habits of this wapiti has been reported by Herr Dörries, who is one of the few Europeans who have explored its habitat. Its favourite resorts are the dense pine forests extending from the Amur to the Lower Ussuri. From these it never issues forth in order to graze till about ten o'clock in the morning, and when abroad, it is one of the most wary of all the deer tribe. The pairing-season commences about the end of September or the beginning of October, and lasts for about a fortnight, during which time the old stags are roaring incessantly from morning till night.

d. ALTAI RACE—*CERVUS CANADENSIS ASIATICUS*

Cervus maral (*canadensis* var.), Severtzoff, *Turkestan Jevotnie*, pp. 62, 103 (1873), *Ann. Mag. Nat. Hist.* ser. 4, vol. xviii. p. 377 (1873).

MUSEUM OF MELBOURNE



ALTAI WAPITI.

Cervus maral, var. *asiatica*, Severtzoff, *Turkestan Jevotnie*, p. 109 (1873), *Ann. Mag. Nat. Hist. t.c.* p. 386.

Cervus eustephanus, Blanford, *Proc. Zool. Soc.* 1875, p. 637, *Scient. Results Second Yarkand Mission—Mamm.* p. 90 (1879) ; Brooke, *Proc. Zool. Soc.* 1878, p. 912 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 184 (1891) ; Ward, *Records of Big Game*, p. 42 (1896).

Cervus canadensis eustephanus, Blanford, *Proc. Zool. Soc.* 1893, p. 447.

Plate VI

Characters.—Although generally like the East American wapiti, this sub-species may readily be distinguished by its inferior stature, relatively longer body and still shorter legs, and absolutely larger antlers ; being, in respect to the development of the latter, decidedly the finest member of the group. Indeed, in this point it may be compared to the barren-ground reindeer, which, although a smaller animal than the woodland race, has larger antlers. The colour of the pelage of the upper-parts is yellowish tawny at all seasons, with no tinge of red.

Distribution.—The Altai and Thian-Shan Mountains, which form the forest districts to the west of the Mongolian desert.

History.—The name *C. eustephanus* was applied by Mr. Blanford to certain shed antlers purchased by the members of the Second Yarkand Mission in Kashgar, and stated to come from the forests of the Thian-Shan. A pair of these antlers (the types) are preserved in the Indian Museum, Calcutta, and there are three single specimens in the British Museum, two of which belonged to adults, and the third to an immature animal. Of the Calcutta specimens, Mr. Blanford writes that “they have apparently been shed, and they probably belonged to different animals. They are of large size, each measuring 51 inches along the curve ; one is 10.9, the other 10.5 inches in circumference at the base, just above the burr. Each shows seven well-formed tines, so that the animal must have had fourteen points. The beam is very much curved, and, so far as it is possible to judge from the form of the burr, the horns must bend somewhat towards each other at the tips and branch less apart than in most stags. The brow-antler and bez are close together, the former slightly exceeds the latter in length, and the bez (second) is rather larger than the royal (third). The greatest peculiarity of the horns, however, is in the form of the crown. Above the royal the

beam curves inwards and gives out an anterior (fourth) tine which is much the largest of all, and slightly compressed, being only a little shorter, and scarcely smaller, than the beam itself. Above this the beam gives out two other tines, each successively diminishing in length, and all these four branches, that is, the beam itself and the three upper tines, are in nearly



FIG. 27. Altai Wapiti at Woburn Abbey. Photographed by the Duchess of Bedford.

the same plane, so that by looking at the horn with either the beam or the great fourth tine in front, the remainder of the crown can be concealed behind either one or the other. . . . It appears to me that, as regards the horns, the Thian-Shan stag approaches the wapiti more than any Asiatic deer. The resemblance between the Asiatic stags and *Cervus canadensis* has been discussed by many naturalists, and by none more fully than by Mr. Blyth, who has pointed out that the most important characters in which

the horns of the American stag differ from those of the animals found in Eastern Tibet, Kashmir, and Persia are the smoothness of the former, their tendency to flattening or palmation of the crown, their great subdivision in the coronal region, and the marked backward curvature and want of convergence in the upper portion of the beam. Now in all these characters the horns brought from Turkestan appear to be intermediate between those of the other Asiatic stags and the wapiti. The horns of the Turkestan stag differ from those of the wapiti in being less smooth, more curved inwards towards the ends, and in having the brow- and bez-antler much nearer, but they are much nearer to the wapiti horns than they are to those of *C. cashmirianus* or *C. affinis*.

“There can, I think, be very little doubt that *Cervus eustephanus* is the animal described by Severtzoff and Prezewalski as inhabiting the forests of the Thian-Shan and neighbouring ranges. It is a very large animal—as indeed is evident from the dimensions of the horns—adults being, according to Severtzoff, as much as 6 feet high at the shoulder. It is probably known as *maral* by the Arian tribes of Central Asia, the word being Persian for deer. The true *C. maral*, however, inhabiting the forests on the southern coasts of the Caspian, and in the Caucasus, etc., is a much smaller animal, with differently shaped horns.”

The antlers in the British Museum were subsequently examined by Sir Victor Brooke, who pronounced them indistinguishable from those of the true wapiti, of which species Mr. Blanford finally came to the conclusion that the present form is only a variety. All the characters he gives are essentially those of wapiti antlers, of which they are an excellent description. That the deer described by Severtzoff are identical with *C. eustephanus* may be considered beyond doubt, certain slight points of difference from the type of the latter being of no importance ; and as the name *asiaticus* is the earlier of the two, it is entitled to stand for the sub-species.

The first living examples of the Altai wapiti received in England were a small herd from the Altai purchased in the autumn of 1896 by the Duke of Bedford from Mr. Hagenbeck. These comprised three stags and several hinds. On their arrival at Woburn Abbey the antlers of the stags were so injured as to afford no distinctive characters, although they seemed to indicate that the animals were immature. The new antlers developed in the spring of 1897 were, however, precisely similar to the shed specimens

from the Thian-Shan described as *C. eustephanus*, and served not only to show the identity of the Altai and Thian-Shan deer, but also that the Woburn specimens had by this time become fully mature, their antlers carrying seven tines each, with the great development of the fourth tine characteristic of the wapiti. The stags are, however, considerably smaller than some full-grown American wapitis in an adjoining paddock at Woburn Abbey, although their antlers appeared decidedly larger. And as a full-grown American wapiti stands not more than 5 feet 4 inches (16 hands) at the withers, the height of the Altai specimens may be roughly estimated at 5 feet, or 5 feet 2 inches. This leads to the conclusion that the height (6 feet) given by Severtzoff is excessive; and it may be suggested that it is either due to a misprint in his text, or that the height of the animal was estimated from the antlers, which, as being larger than ordinary examples of the true wapiti, would naturally lead to the conclusion that the animal itself was superior in stature to the latter.

Habits.—Mr. St. George Littledale, who is one of the few Englishmen that have seen it in its native haunts, tells me that this wapiti inhabits thickly wooded districts in the Altai, and is very difficult of approach. During the winter months large numbers are captured by the natives, who drive them into nets. Extensive herds of such captive animals are kept in domestication for the sake of their antlers, which are exported to China for medicine, fine specimens realising as much as £10 each. During the pairing-season the cry of the two old stags at Woburn Abbey was somewhat intermediate between that of the red deer and that of the American wapiti, commencing with a roar exactly like that of the former, but sometimes concluding in a squeal resembling that of the latter.

7. THE BOKHARA DEER—*CERVUS* *sp. nov.* (?)

Characters.—This deer, which appears to be an undescribed species, is represented by an adult male now living in the Zoological Gardens at Moscow, to which institution it was presented by the Governor of Russian Turkestan. The Duke of Bedford has a pair of the shed antlers. For the following notes, as well as the photograph from which the accompanying figure was taken, I am indebted to Mr. Carl Hagenbeck.

Height at shoulder, 4 feet. Antlers of the general type of those of the

shou, showing a nearly similar forward curvature near the trez-tine, but normally with only four points, owing to the absence of the bez-tine. Head short and broad. Tail about 4 inches in length. General colour of pelage at all seasons ashy gray with a light yellowish sheen ; a darker line down the middle of the back ; a small light-coloured caudal disk, including the tail, and bordered inferiorly by a blackish streak ; legs brownish.

The antlers, which have been of the same general type for the last four



FIG. 28.—The Bokhara Deer. From the Moscow specimen.

years, are simpler than in any other member of the group, but come nearest to those of the shou. The absence of the bez-tine appears to be constant ; but in the shed pair in the possession of the Duke of Bedford there are five tines on the left side, apparently due to abnormal development, as the terminal fork is much smaller on this than on the opposite side. The brow-tine, as in the shou, rises immediately above the burr. Probably this deer indicates a small western representative of the last-named species.

Distribution.—Russian Turkestan.

ii. THE SIKINE GROUP—SUB-GENUS PSEUDAXIS

Pseudaxis, Gray, *Cat. Ruminants Brit. Mus.* p. 70 (1872) ; Brooke, *Proc. Zool. Soc.* 1878, p. 907, as a sub-genus.

Elaphoceros, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 602 (1873), lxxix. part i. p. 596 (1874).



FIG. 29. Antlers of Japanese Sika. From specimens presented to the British Museum by Viscount Powerscourt.

Sika, Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 17 (1888).

Sikelaphus, Heude, *op. cit.* vol. ii. p. 146 (1894).

Characters.—Antlers smaller and simpler than is usually the case in the preceding group, flattened, generally four- (occasionally five-) tined, with

NATIONAL MUSEUM OF MELBOURNE



MANCHURIAN SIKA IN WINTER PELAGE.

a trez (third) but no bez (second). Pelage of adult spotted with white, at least in summer, and a pure white area bordered with black in the region of the tail, which is also white and black; young more or less distinctly white-spotted; metatarsal tuft generally whitish. Throat maned; head shorter than in the preceding group; ears and tail moderate. Naked portion of muzzle larger than in the preceding group, extending well on to the upper surface of the face, and being very wide between the nostrils and the upper lip. Rudimentary upper canines present; upper molars of the general type of those of the elaphine group. The face-gland, or tear-pit, moderately developed. Size medium. In the growing antlers the velvet is of a deep red colour, passing into black at the tips of the tines, and thus matching the summer pelage. Sir Victor Brooke stated that the winter coat is always without spots, and this error has been frequently repeated.

Distribution.—Now confined to the south-eastern portion of the Eastern Holarctic and some adjacent parts of the Oriental region, but apparently represented in Europe during the Pliocene epoch.

In their spotted coloration and comparatively simple antlers, the sikas are evidently a less specialised type than the elaphine group, and if, as appears probable, they date from the Pliocene, they might well be the ancestors both of the latter and of the fallow deer group. They have frequently been considered as near relatives of the sambar group,¹ although I cannot satisfy myself that this is well founded.

I. THE COMMON SIKA—CERVUS SICA

Cervus (Hippelaphus) japonicus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 177 (1846), as commonly quoted; no specific name was, however, really given, the word *japonicus* (printed in ordinary type) merely signifying that the new deer came from Japan, and not being its scientific title.

Cervus sika, Temminck and Schlegel, *Fauna Japon.*—*Mamm.* p. 54 (1847); Sclater, *Proc. Zool. Soc.* 1860, p. 377, *Trans. Zool. Soc.* vol. vii. p. 346 (1871); Brooke, *Proc. Zool. Soc.* 1878, p. 908; Powerscourt, *ibid.* 1884, p. 208; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 39 (1891); Ward, *Records of Big Game*, p. 21 (1896).

Cervus syka, Pucheran, *Arch. Mus. Paris*, vol. vi. p. 398 (1852).

¹ See Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 603.

Rusa japonica, Gray, *Ann. Mag. Nat. Hist.* ser. 3, vol. vi. p. 218 (1860), *Proc. Zool. Soc.* 1861, p. 236; Sclater, *Proc. Zool. Soc.* 1860, p. 365, 1862, p. 150—*javanica*.

Pseudaxis sika, Gray, *Cat. Ruminants Brit. Mus.* p. 72 (1872), *Hand-list Ruminants Brit. Mus.* p. 142 (1873).

Elaphoceros sika, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 352 (1873), lxix. part i. p. 602 (1874).

Cervus euöpis, Swinhoe, *Proc. Zool. Soc.* 1874, p. 151; Brooke, *ibid.* 1878, p. 908.

Axis sika, Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 93 (1881).

Characters.—Size very variable. Pelage bright rufous chestnut, spotted on the body with white in summer; uniformly coloured, or nearly so, in winter, when it is dark umber-brown, with the hairs annulated; a light chestnut patch on the shoulder; white on the side of the upper, and the whole of the lower lip; tail mainly white, frequently with a narrow black line on the upper surface and sometimes a dark terminal tuft; caudal patch large. Inside of ears and part of base of outer surface of same covered with pure white hairs.

Distribution.—Northern China, Manchuria, and Japan.

a. JAPANESE RACE—*CERVUS SICA TYPICUS*

Characters.—Size small, the height of the typical form varying from 2 feet 8 inches to 2 feet 10 inches; white area of caudal region very large, extending on to the sides of the buttocks, and completely bordered with black above and at the sides.

The typical Japanese sika is a beautifully coloured little deer, with a bright chestnut red coat profusely spotted on the body with longitudinal rows of white spots in summer, but turning to a uniform blackish brown with the assumption of the winter dress. Generally all traces of the white spots completely disappear at the latter season, although occasionally more or less distinct vestiges of these may persist, more especially in hinds. When in the velvet, the antlers are of a bright chestnut red, with black tips, and at this season the bucks look their handsomest. The head and neck are uniformly coloured at all seasons, the back of the neck in the summer pelage being of the same tint as the ground-colour of the body, while the head and throat are more fawn-coloured. The black-bordered white area in the

region of the tail stands out in bold contrast to the general colour at all seasons. The metatarsal tuft is very distinct.

Originally this deer was supposed to be confined to Japan, but Mr. Swinhoe described, under the name of *C. euöpis*, a specimen from China, now in the British Museum, which, as Sir Victor Brooke states, can in no wise be distinguished from the typical island form. The first examples of this deer brought to England were received at the Zoological Society's Gardens in 1860, but later on other Japanese examples arrived which were of larger size, and thus served to connect the typical form with the larger Manchurian race referred to below. This led Sir Victor Brooke¹ to express the opinion that when a larger series of these deer were acquired, it would be found impossible to separate them into definite species, but that they would constitute local races of a single very variable specific type; and it is very difficult to believe that this is not the correct view, although in certain points the typical *manchuricus* differs very markedly.

A large herd of sikas maintained in the park at Woburn Abbey exhibit considerable variation in size, and tend to show that eventually a series may be obtained graduating in height from the 2 feet 8 inches of the typical Japanese race to the 3 feet 3 or 5 inches of the Manchurian race.

From the following list, which is taken from Mr. Rowland Ward's book, it would appear that from eight to ten points are occasionally developed in the antlers of the species, although I have never seen specimens with more than five on each side.

Length on Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.	Locality.
31 $\frac{1}{4}$	5 $\frac{1}{4}$	27 $\frac{1}{8}$	27 $\frac{3}{8}$	4-4	?
25 $\frac{3}{8}$	4 $\frac{1}{8}$	20 $\frac{1}{4}$?	4-4	?
22 $\frac{1}{2}$	3 $\frac{1}{8}$	16 $\frac{1}{8}$	19 $\frac{1}{2}$	8-9	Japan
22	4	16 $\frac{3}{4}$	13 $\frac{3}{4}$	5-4	Bred in Ireland
21 $\frac{5}{8}$	3 $\frac{3}{8}$	16 $\frac{1}{2}$	20 $\frac{1}{8}$	10-6	Yezzo
18 $\frac{1}{2}$	3 $\frac{3}{4}$?	12	9	Bred in Ireland
18 $\frac{1}{2}$	3 $\frac{1}{8}$	11	12 $\frac{1}{4}$	4-4	Japan
16 $\frac{3}{4}$	3 $\frac{1}{8}$?	13	4-3	"
16 $\frac{5}{8}$	3	9 $\frac{5}{8}$	10	4-3	Bred in Ireland
15 $\frac{1}{2}$	2 $\frac{3}{4}$	9 $\frac{3}{4}$	10 $\frac{1}{2}$	4-4	Bred in England
15 $\frac{1}{4}$	3 $\frac{3}{8}$	12 $\frac{1}{4}$	10 $\frac{1}{2}$	4-4	Bred in Ireland

¹ *Proc. Zool. Soc.* 1878, p. 909.

Distribution.—Japan and Northern China.

Habits.—Nothing of importance has been recorded of the habits of these pretty little deer in their native country. In English and Irish parks they thrive exceedingly well, and have much the same general habits as red deer. The cry of the bucks in the pairing-season is a kind of whistle, sometimes passing into a scream. In Lord Powerscourt's park male sikas have crossed with red deer hinds. In view of Sir Victor Brooke's statement as to the true red deer refusing to interbreed with the Caspian race of the same species, this is a most remarkable circumstance. Two pairs of antlers belonging to the hybrid race are preserved in the British Museum, both of which possess bez-tines. In the park at Woburn Abbey, where these deer run with the fallow and red deer, they feed chiefly by grazing, although they eagerly take boughs when offered. When startled and running off, these and the Manchurian sikas expand and dilate the long white hairs of the caudal disk, thereby increasing the distinctness of this conspicuous recognition mark.

b. MANCHURIAN RACE—*CERVUS SICA MANCHURICUS*

Cervus mantchuricus, Swinhoe, *Proc. Zool. Soc.* 1864, p. 169, 1865, p. 1; Sclater, *Trans. Zool. Soc.* vol. vii. p. 344 (1871); Brooke, *Proc. Zool. Soc.* 1878, p. 908; Moellendorff, *Zool. Jahrb.* 1887, p. 588; Ward, *Records of Big Game*, p. 21 (1896).

Pseudaxis mantchurica, Gray, *Cat. Ruminants Brit. Mus.* p. 72 (1872), *Hand-list Ruminants Brit. Mus.* p. 141 (1873).

Cervus kopschi, Swinhoe, *Proc. Zool. Soc.* 1873, p. 574; Brooke, *ibid.* 1878, p. 909.

Elaphoceros mantchuricus, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 597 (1874).

Axis mantschuricus, Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 93 (1881).

Cervus sica manchuricus, Lydekker, *Proc. Zool. Soc.* 1897, p. 39.

Plate VII

Characters.—Size larger than the last, the height at the shoulder ranging up to 3 feet 3 inches. The white area in the region of the tail much smaller, so as scarcely to be apparent in a side view, but completely bordered

with black. Spots and a tinge of red frequently retained on the hind-quarters of does in winter pelage.

The type specimen of this form was a living buck procured by Mr. Swinhoe at Ying-tzu-kou (Nuchwang), the treaty port of Manchuria, and forwarded to the London Zoological Gardens, where it arrived in July 1864. It is figured by Mr. Sclater, in plate xxxi of vol. vii. of the Society's *Transactions*, in summer pelage, and in plate xxxii in its winter dress. The summer coat is well spotted, whereas the winter dress is a rich uniform



FIG. 30.—Buck and Doe of Manchurian Sika in winter pelage. From a photograph by the Duchess of Bedford.

umber-brown, with light chestnut patches on the shoulders, faint traces of the spots showing on the fore part of the back, and the under-parts being dark. In the summer coat there is a black patch above the white area on the tail, and a black line down the middle of the upper surface of the latter ; but in the winter pelage very little black remains.

The height of the type specimen is given as 3 feet 8 inches, but I am inclined to think this is a misprint for 3 feet 3 inches, or 5 inches, as a stuffed buck in summer pelage at Woburn Abbey agrees in all respects with the type, but only measures about 3 feet 2 inches at the shoulder ;

and although evidently not fully mature, I cannot think it would ever have grown six inches more. It shows a distinct light metatarsal tuft, which is not apparent in the figure of the type, but may have been accidentally omitted. Except for the reduced size of the white caudal patch, this animal is in all respects essentially a large variety of the Japanese sika. The type of *C. kopschi*, from China, is in the British Museum, and appears rightly identified by Sir Victor Brooke with this race.

Distribution.—South-Western Manchuria, or Shingking, typically from the neighbourhood of Ying-tzu-kou (Nuchwang), but probably occurring in other parts of Northern China. In habits this form is doubtless identical with the last.

2. THE FORMOSAN SIKA—*CERVUS TAËVANUS*

Cervus taiouanus, Blyth, *Journ. As. Soc. Bengal*, vol. xxix. p. 90 (1860); Sclater, *Proc. Zool. Soc.* 1860, p. 376.

Cervus taëvanus, Sclater, *Proc. Zool. Soc.* 1862, p. 152, *Trans. Zool. Soc.* vol. vii. p. 345 (1871); Swinhoe, *Proc. Zool. Soc.* 1862, p. 362; Brooke, *ibid.* 1878, p. 909; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 45 (1891); Ward, *Records of Big Game*, p. 22 (1896); Lydekker, *Proc. Zool. Soc.* 1897, p. 45.

Pseudaxis taiwanus, Gray, *Cat. Ruminants Brit. Mus.* p. 70 (1872), *Hand-list Ruminants Brit. Mus.* p. 141 (1873).

Elaphoceros taëvanus, Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 599 (1874).

Axis taiwanus, Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 93 (1881).

Plate VIII

Characters.—Nearly allied to the common sika, but distinctly spotted in winter. Height medium, apparently about 2 feet 11 inches at the shoulder. The face shorter, the muzzle more pointed, the limbs shorter, and the body longer than in the common sika. Ground-colour of summer pelage light chestnut, with large white spots, and a deep red tinge on the hinder part of the neck; in winter the spots less numerous; the black border to the white caudal area forming a more distinct bar superiorly, the median black line on the tail broader, and the dark line down the back very strongly marked.



FORMOSAN SIKA IN WINTER PELAGE.

2017年12月11日

NATIONAL MUSEUM MELBOURNE



PEKIN SIKI IN WINTER PELAGE.

Such are the characteristics to be drawn from the descriptions of Messrs. Sclater and Swinhoe, supplemented by the specimens at Woburn Abbey. The first example of this deer seen in England was sent by Mr. Swinhoe, and arrived at the Zoological Gardens in December 1861. Between that date and 1867 six other specimens were received, and in the following year a fawn was born. Up to 1896 the only other specimen was a male presented in the summer of 1889. I have had no opportunity of studying living specimens which could be confidently referred to this form, with the exception of two living at Woburn Abbey in 1896-97, one of which is figured in plate viii. The shortness of the face is a common feature in many island deer.

Distribution.—Formosa. There is nothing to lead to the belief that this deer has been introduced into the island.

3. THE PEKIN SIKA—*CERVUS HORTULORUM*

Cervus pseudaxis, Gray, *Proc. Zool. Soc.* 1861, p. 236, *nec* Eydoux and Souleyet.

Cervus hortulorum, Swinhoe, *Proc. Zool. Soc.* 1864, p. 169; Lydekker, *ibid.* 1897, p. 42.

Cervus dybowskii, Taczanowski, *Proc. Zool. Soc.* 1876, p. 123; Brooke, *ibid.* 1878, p. 909; Noack, *Humboldt*, vol. viii. p. 4, fig. 1 (1889); Lydekker, *Proc. Zool. Soc.* 1897, p. 40; *nec* W. L. Sclater, *Journ. As. Soc. Bengal*, vol. lviii. p. 186 (1889), *Cat. Mamm. Ind. Mus.* part ii. p. 182 (1891).

Cervus dybowski, Ward, *Records of Big Game*, p. 22 (1896).

Plate IX

Characters.—Size large, intermediate between that of a chital and a red deer, the height at the shoulder being about 3 feet 7 inches (113.5 centimetres). Antlers very large and rugged, less flattened than in the common sika, with the brow-tine given off from the beam some distance above the burr. Summer pelage with large white spots; winter coat of adult very long and shaggy, more or less uniformly coloured, except on the flanks and lower part of the thighs, where it is light fawn, with traces of spots on the hind-quarters; little or no pure white on the upper lip, the middle of which is chestnut; the white caudal area in adults small and inconspicuous,

not extending on to the outer surface of the buttocks ; tail bushy, white with a black tip.

The coloration of the winter pelage is described by Professor Noack as follows :—General colour yellowish umber-brown, tending more to yellow in front and to umber behind, and becoming darker on the back ; head as far as the nose yellowish brown, forehead and neck reddish brown, nose



FIG. 31.—Head of Pekin Sika. From a specimen in the Museum at Woburn Abbey. Photographed by the Duchess of Bedford.

grayish red, upper lip yellowish red, the dark spot on the grayish white lower lip moderately large ; ear thickly haired, dirty gray internally, rusty red externally. Mane on head and neck very long and shaggy, whitish gray in colour ; chest nearly black ; under-parts whitish gray ; the white caudal patch bordered in front with black ; tail white with a black tip. Metacarpus yellowish red, metatarsus umber-brown, each with a dark streak in front ; no light metatarsal tuft.

Two hinds in transition dress are described as bright roe-colour ; the individual hairs being umber mingled with blackish brown ; the forehead darker than in the winter coat, and the whitish base of the ear very conspicuous.

In immature animals (plate ix) the pelage is spotted with white at all seasons, although more fully in summer than in winter, when it is very long and shaggy. Bucks in winter with the ground-colour of the body bright chestnut-brown ; neck with-

out spots, bluish gray at the base, then a blackish collar, followed by chestnut ; face bluish gray ; thighs and fore-legs grayish brown ; under-parts grayish white ; and often a dark band above the white on the buttocks. In summer the general body-colour chocolate-brown.

The plate represents an immature stag and two hinds living in the park at Woburn Abbey in early winter pelage. Later on in the winter the coat becomes more shaggy, and the under-parts a deep leaden gray.

In their second winter season the spotting was much less conspicuous, less white was apparent on the buttocks, and the whole colour was browner.

The history of this species is somewhat remarkable. In the spring of 1861 the Zoological Society received from the late Mr. R. Swinhoe the skins of three sikine deer which had been shot after the taking of the Summer Palace, Pekin (12th October 1860), when they would have assumed the winter pelage. These specimens were shortly after transferred to the British Museum, and one, a buck (No. 61. 6. 2. 1), was described and figured by Dr. Gray in the *Proceedings* of the Zoological Society for 1861, under the name of *Cervus pseudaxis*, with the express statement that it was killed in autumn. As now mounted it stands 3 feet 4 inches at the shoulder. The hair is now much faded. In Dr. Gray's figure¹ the hair of the body is a chestnut-brown colour, with numerous distinct white spots of considerable size; and there is a white glandular patch on the outer side of the hind leg just below the hock. The neck is unspotted, and its lower portion is of a slaty-blue colour, above which there is a dark collar, followed by chestnut-brown, the lower part of the face being also bluish gray. The under-parts are whitish; and the tail is white with a narrow black median line and tip, but there is no distinct black cross on the buttocks. This deer, which is about two years old, is therefore quite unlike *C. sica* in its winter coat.

The female (No. 61. 6. 2. 2) appears to be similarly coloured, with the exception that there is no slaty-blue on the neck, and the under-parts are grayish, while there is a distinct black cross on the buttocks. Its height at the shoulder is 2 feet 9 inches.

In 1864 Mr. Swinhoe, being satisfied that the buck figured by Dr. Gray was not the *Cervus pseudaxis* of Eydoux and Souleyet, proposed for it the name of *C. hortulorum*. In the same letter the name *C. mantchuricus* was suggested for certain specimens sent home alive at the same time for the Zoological Gardens; and it is quite evident that Swinhoe was satisfied of the distinctness of the two forms. The young stag represented in the plate differs from the type specimen mainly by the larger amount of black and white on the buttocks, but as the Woburn hinds are precisely similar

¹ From a comparison with the original specimen, I find that the colouring of the figure is inexact in several particulars, the under-parts being too white and the distribution of the colours on the neck very badly shown.

to the original hind sent home by Mr. Swinhoe, no doubt can be entertained as to the specific identity of all the specimens.

Dybowski's deer was originally described by Professor Taczanowski from several examples obtained from the Ussuri district of North-Eastern Manchuria, one of which (a male) was presented to the British Museum, where it is preserved. Although not fully mature (the antlers being small), it measures 3 feet 5 inches at the shoulder. It is in winter dress, and has somewhat the general appearance of a very large Manchurian sika, although with a much smaller white caudal patch, no light metatarsal tuft, and the general colour somewhat lighter, although this last difference may be due to fading. If Professor Taczanowski's description be referred to, it will be found that the Ussuri deer is compared with *Cervus axis* and *C. dama*, without any reference to the sikas. One specimen in the original description is stated to be the colour of a roe in winter pelage, with faint traces of dappling on the hind-quarters, but another was lighter; and the Museum example shows little traces of spots. A more mature head (Fig. 31) is in the possession of the Duke of Bedford. Sir Victor Brooke considered that this deer might prove identical with *C. manchuricus*, and this view was adopted by Herr Moellendorff, and subsequently by myself. I had, however, at that time not seen the paper by Herr Noack, who regards the North Manchurian sika as a perfectly distinct species. And at that time the specimens at Woburn, figured in plate ix, were not nearly so like the types of *C. dybowskii* as they have since become. The present form seems to be a large, shaggy-haired deer, adapted for living in a cold climate.

Distribution.—The district of the Ussuri river, in North-Eastern Manchuria, but recorded by Herr Noack from the south-west of Vladivostock, near the borders of Corea. The distributional area is, therefore, probably more northerly and easterly than that of the Manchurian sika.

Habits.—From information furnished by Herr Dörries, a few notes on the habits of this deer have been published by Herr Noack in *Der Weidmann* (the German *Field*) for 14th August 1891.

From these it appears that the Pekin sika is found in thin forest near the coast, especially on the island of Ascold. The pairing-season commences at the end of September, during which the old stags will call

without ceasing an hour at a time. Most of the specimens captured are taken after deep falls of snow ; and the antlers, like those of the Manchurian wapiti, find a ready sale in China for medicinal purposes.

4. THE MANDARIN SICA—*CERVUS MANDARINUS*

Cervus mandarinus, Milne-Edwards, *Rech. Mamm.* p. 184 (1871) ; Brooke, *Proc. Zool. Soc.* 1878, p. 968 ; Lydekker, *ibid.* 1897, p. 44.

(?) *Cervus axis*, Swinhoe, *Proc. Zool. Soc.* 1864, p. 169, *nec* Erxleben.

(?) *Cervus mantschuricus major*, Noack, *Humboldt*, vol. viii. p. 5, fig. 4 (1889).

Characters.—This doubtful species is definitely known by the type specimen preserved in the Museum at Paris, and from the figure of which the following characters are taken. Size very large. Pelage spotted at all seasons, and apparently very long and shaggy in winter. Colour redder than in the preceding species, with the spots abundant in the winter pelage, when the neck and limbs are similar in tint to the ground-colour of the body ; under-parts dark ; metatarsal tuft apparently similar in colour to the rest of the leg ; tail comparatively long, mainly reddish, with but little white. In his original description Professor Milne-Edwards remarks that this deer is distinguished from *C. manchuricus* by the more profuse spotting of the summer coat, and the retention of a large, although somewhat smaller, number of distinct spots in the winter dress on the body—the ground-colour of the latter being dark chestnut-brown, and the neck and under-parts also brown ; while there is a very thick frill of long hairs on the throat. It is also mentioned that the colour of the summer coat is much brighter than in *C. manchuricus*. These observations are fully borne out by the two plates accompanying the memoir, which illustrate the type specimen at both seasons. Sir Victor Brooke gives *mandarinus* as a synonym of *manchuricus*, without a word as to the persistence of the spotting in winter. And the influence of one so well known as an authority on the group has led to *C. mandarinus* being ignored by subsequent writers.

In a letter published in the *Proc. Zool. Soc.* for 1868 Mr. Swinhoe wrote as follows :—“In the gardens of Messrs. Jardine, Matheson, and Co., in Hong-Kong, I saw several bucks and does of *C. sica* and *C. taëvanus*, as also of *C. axis* in winter dress. The bucks of the two former had manes about

the neck ; *C. sica* was spotless, *C. taëvanus* with indistinct spots, while *C. axis* was of a rich yellowish-brown colour, with distinct white spots. The latter had long, thin, reddish tails, and, I think, are identical with the true *C. axis*. They are from Hankow, interior China." Now as Mr. Swinhoe must be presumed to have been well acquainted with both *C. manchuricus* and *C. hortulorum*, and as *C. axis* is unknown beyond India, it is possible that these deer were really *C. mandarinus*. The "long, thin, reddish tails" appear to accord well with Professor Milne-Edward's figure of the latter in winter dress.

Distribution.—Northern China and (?) Manchuria ; whether the specimens mentioned by Mr. Swinhoe really came from Hangchau may perhaps be doubtful.

So far as the available material admits of forming an opinion, there seems considerable probability that the stag from Manchuria described and figured by Professor Noack under the name of *C. mantschuricus major* may prove to be identical with the present form. It is stated to be as large as a red deer, standing 4 feet at the shoulder, and is apparently very rare. It was identified by its describer with *C. hortulorum* (*C. pseudaxis*, Gray). In any case, the name *C. major* cannot be used for it on account of pre-occupation by *C. major*, Ord, and also by *Axis major*, Hodgson. Possibly it is the same as the Pekin sika.

5. THE PLIOCENE SIKI—*CERVUS PERRIERI* (*Extinct*)

Cervus perrieri, Croizet and Jobert, *Oss. Foss. Puy-de-Dôme—Cervidæ*, plate iv (1828) ; Dawkins, *Quart. Journ. Geol. Soc.* vol. xxxiv. p. 407 (1878) ; Depèret, *Bull. Soc. géol. France*, ser. 3, vol. xii. p. 268 (1884) ; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 107 (1885).

Cervus etueriarum, Croizet and Jobert, *op. cit.* plate vi (1828) ; Dawkins, *op. cit.* p. 410 (1878) ; Depèret, *op. cit.* p. 265 (1884) ; Lydekker, *op. cit.* p. 107 (1885).

Cervus pardinensis, Croizet and Jobert, *op. cit.* plate xi (1828) ; Dawkins, *op. cit.* p. 409 (1878) ; Depèret, *op. cit.* p. 262 (1884).

Cervus issiodorensis, Pomel, *Cat. méthodique*, p. 105 (1853) ; Dawkins, *op. cit.* p. 407 (1878) ; Depèret, *op. cit.* p. 263 (1884) ; Lydekker, *op. cit.* p. 107 (1885).

Cervus rusoides, Pomel, *op. cit.* p. 106 (1853).

Characters.—This species is known merely by detached antlers, which are typically four-tined, and agree closely with those of the existing members of the present group. *Cervus etueriarum* and *C. pardinensis*, which are doubtless identical, were founded upon three-tined antlers from the same deposits. These have very generally been regarded as indicating rusine deer, although Professor Boyd Dawkins has already pointed out that the typical three-tined antler of *C. pardinensis* might well have belonged to an immature individual of *C. perrieri*—the four-tined form. In this view I thoroughly concur, the three-tined antlers being decidedly more like those of immature sikas than those of adult members of the sambar group. Moreover, both types occur in the same deposits, which is of itself strong *prima facie* evidence of their specific identity. Since, with the exception of those of *Anoglochis ardeus*, antlers of a more complex type are unknown from these beds, it would seem that four is the maximum number of tines developed, and hence that the species belongs to the sikine group—a matter of some importance from an evolutionary point of view. The brow-tine is situated close to the burr, and branches off from the beam at an acute angle.

By Professor Depèret the antlers described as *C. pardinensis* are referred to the rusine group, while those to which the other names belong are all regarded as indicating primitive members of the elaphine group, the latter opinion harmonising to a great extent with that followed here.

Distribution.—Europe (France and Italy) during the latter portion of the Pliocene period.

INCERTÆ SEDIS

1. *Cervus pseudaxis*

Cervus pseudaxis, Eydoux and Souleyet, *Voyage de 'I.a Bonite,' Zoology*, vol. i. p. 64 (1841-52); Brooke, *Proc. Zool. Soc.* 1878, p. 909; Lydekker, *ibid.* 1897, p. 38.

Axis pseudaxis, Gray, *Cat. Ungulata Brit. Mus.* p. 214 (1852); Fitzinger, *SB. Ak. Wien*, vol. lxix. part i. p. 274 (1874).

Sikelaphus pseudaxis, Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 146 (1894).

With regard to this nominal species, I can only follow Sir Victor Brooke, who observes that he has hesitated to identify it with "any species of the sub-genus. The type specimen is still preserved in the Muséum d'Histoire Naturelle at Paris; but though

I have often carefully examined it, the absence of the skull, and the great uncertainty of the locality where it was procured, render it impossible to form a decided opinion." Mr. Sclater has suggested that it really belongs to *C. taëvanus*, in which case that name would have to be superseded; *pseudaxis* being the earliest of all.

"The animal which has been figured under the name of *Cervus pseudaxis*," writes Dr. Gray, "was obtained by MM. Eydoux and Souleyet in Java, but they did not believe that it was a native of that country. It lived several years in the Jardin des Plantes at Paris, and hence a series of its horns was procured and figured; and while there it bred with the common axis, and the mule produce was fertile. Some naturalists have given the Sooloo [Sulu] Islands, near the Philippines, as the habitat of this specimen, but I do not know on what authority." Mr. A. H. Everett informs me that there are deer in the Sulu Islands, doubtless introduced. From his description they appear to be sikas, and if so, they are not improbably *C. taëvanus*. Père Heude has assigned a name to these Sulu deer.

2. Other Names

The following names have been applied by Père Heude (*Mém. hist. nat. emp. Chinois*) to specimens from China, Japan, and the Sulu Islands belonging to the present group, viz. :—

1. *Sikelaphus soloensis*, vol. ii. p. 147 (1894).
2. *Sika poouvrelianus*, „ p. 149 „
3. „ *brachyrhinus*, „ p. 151 „
4. „ *andrianus*, „ p. 152 „
5. „ *grilloanus*, „ p. 154 „
6. „ *dugenneanus*, „ p. 156 „
7. „ *joretianus*, „ p. 157 „
8. „ *oxycephalus*, „ p. 158 „
9. „ *frinianus*, „ p. 159 „
10. „ *cycloceros*, „ p. 160 „
11. „ *surdescens*, „ p. 161 „
12. „ *lacrymans*, „ p. 162 „
13. „ *arietinus*, „ p. 162 „
14. „ *yuanus*, „ p. 162 „
15. „ *sendaensis*, vol. iii. p. 98 (1896).
16. „ *blakistonius*, „ p. 98 „
17. „ *dolichorhinus*, „ p. 100 „
18. „ *aplodonticus*, „ p. 100 „
19. „ *schizodonticus*, „ p. 100 „
20. „ *orthopodicus*, „ p. 100 „

- | | | | | |
|-----|------------------------|-----------|--------|---------|
| 21. | <i>Sika mitratus</i> , | vol. iii. | p. 102 | (1896). |
| 22. | „ <i>ellipticus</i> , | „ | p. 103 | „ |
| 23. | „ <i>elegans</i> , | „ | p. 103 | „ |
| 24. | „ <i>minoensis</i> , | „ | p. 104 | „ |
| 25. | „ <i>rutilus</i> , | „ | p. 105 | „ |
| 26. | „ <i>yessoensis</i> , | „ | p. 105 | „ |

iii. THE DAMINE GROUP—SUB-GENUS DAMA

Alce, Blumenbach, *Beiträge Naturgeschichte*, 1st French ed. vol. ii. p. 407 (1803).

Dama, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 306 (1827); Gray, *List Mamm. Brit. Mus.* p. 181 (1843); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 349 (1873), lxxix. part i. p. 546 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 913; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 43 (1881).

Megaceros, Owen, *Rep. Brit. Assoc.* for 1843, p. 237 (1844).

Platyceros, Wagner, Schreber's *Säugethiere*, vol. iv. p. 347 (1854).

Dactyloceros, Wagner, *op. cit.* vol. v. p. 352 (1855).

Palmatus, Giebel, *Säugethiere*, p. 351 (1859).

Characters.—Antlers normally without a bez (second), but with a trez (third) tine, above which the beam is more or less palmated, and generally furnished with numerous spags. Pelage of adult normally spotted with white in summer, uniform in winter with a black-bordered white area in the region of the tail, as in the sikine group; young spotted. Throat not maned; ears moderate; tail rather long; head relatively short. Naked portion of the muzzle much the same as in the red deer group. No upper canines; molars unusually broad transversely; face-gland rather small; size medium or large.

Distribution.—Now restricted to the Mediterranean sub-region of the Eastern Holarctic region, but during the Plistocene and Pliocene epochs ranging over a large part of Europe.

Although the fallow deer were widely separated by Sir Victor Brooke from the sikine group, there seems no doubt that the two are closely allied. A year previously the late Professor Garrod¹ had written that “*Dama*

¹ *Proc. Zool. Soc.* 1877, p. 18.

vulgaris, as well as *D. mesopotamica*, from the shape of their antlers—neglecting the palmation, an evidently insignificant character—are intimately allied to the pseudaxine [equal sikine] group.” It may be added that, in addition to the elaphine, these are the only groups of *Cervus* in which a true trez-tine is developed, and that the two resemble one another in the black and white markings of the caudal region. Moreover, occasionally a bez- (second) tine is developed, thus adding to the elaphine resemblances. Such a tine is exhibited on one side of a pair of antlers of the common species in the collection at Woburn Abbey, where there are also two other pairs showing a small knob on each side just above the brow-tine, which evi-



FIG. 32.—Fallow Deer at Woburn Abbey. From a photograph by the Duchess of Bedford.

dently represent a rudimentary bez. The occasional development of a bez-tine in the common fallow deer has been pointed out by Mr. G. H. Fowler in a paper published in the *Proc. Zool. Soc.* for 1894. Mr. Sclater, while including the sikas in *Cervus*, separates the fallow deer as a distinct genus (*Dama*), but there seems little justification for this course.

Typically the skull differs from that of the red deer group not only by its shortness, but also by its greater breadth, and the larger size of the brain-cavity and the eye-sockets. These characters are also found to a great extent in the giant extinct fallow deer, which was shown by Rütimeyer to be closely allied to the existing forms; and since a connecting link, so far as the antlers are concerned, has been subsequently discovered in Ruff's

fallow deer, there appears every reason for including all in a single group, of which the proper name should be *Alce*.

1. THE COMMON FALLOW DEER—CERVUS DAMA

Cervus dama, Linn. *Syst. Nat.* ed. 12, vol. i. p. 93 (1766) ; Jenyns, *Brit. Vert. Animals*, p. 38 (1835) ; Bell, *Brit. Quadrupeds*, p. 402 (1837) ; Keyserling and Blasius, *Wirbelth. Europ.* p. 26 (1840) ; Brooke, *Nature*, vol. xi. p. 210 (1874), *Proc. Zool. Soc.* 1878, p. 913 ; Busk, *Trans. Zool. Soc.* vol. x. p. 114 (1877) ; Ward, *Records of Big Game*, p. 43 (1896).

Cervus platyceros, Cuvier, *Tableau élém. Hist. Nat.* p. 160 (1798).

Cervus mauricus, de Blainville, *Journ. Physique*, vol. xciv. p. 261 (1822).

Cervus (Dama) dama, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 84, v. p. 306 (1827).

Dama platyceros, Fitzinger, *Beitr. Landesk. Österreichs*, vol. i. p. 317 (1832), *SB. Ak. Wien*, vol. lxviii. part i. p. 350 (1873), lxix. part i. p. 547 (1874).

Dama vulgaris, Gray, *List Mamm. Brit. Mus.* p. 181 (1843), *Cat. Ungulata Brit. Mus.* p. 200 (1852), *Cat. Ruminants Brit. Mus.* p. 74 (1872) ; Loche, *Expéd. Algérie, Mamm.* p. 64 (1867) ; Sclater, *List Animals Zool. Gardens*, p. 171 (1883).

Cervus (Platyceros) dama, Wagner, Schreber's *Säugethiere*, vol. iv. p. 347 (1854).

Cervus (Dactyloceros) dama, Wagner, *op. cit.* vol. v. p. 352 (1855).

Cervus (Palmatus) dama, Giebel, *Säugethiere*, p. 351 (1859).

Dama dama, Lataste, *Act. Soc. Linn. Bordeaux*, vol. xxxix. p. 288 (1885).

Characters.—Height at shoulder about 3 feet. Antlers well palmated and directed largely upwards, with the brow- and trez-tines simple, and the front edge normally devoid of snags, which are, however, numerous on the summit and hinder margin of the palmated portion. General colour of summer pelage in the wild race a brilliant fawn, with large white spots irregularly distributed over the back, upper part of the sides, and haunches ; this spotted region being bounded inferiorly on the sides and posteriorly on the haunches by indefinite white lines ; a blackish line running down the middle of the back and tail ; a white area, bordered above by black on the

buttocks below the tail, and the under side of the tail, under-parts, inner surfaces of upper portions of limbs and inner sides of ears white or whitish. In winter the whole pelage of the upper-parts uniformly grayish fawn.

Owing to long domestication, the fallow deer of the British parks frequently display great variation from this original type of coloration, and a uniformly dark brown breed has been long established, while white or whitish varieties are far from uncommon. Indeed, specimens exhibiting any shade from pure white to nearly jet black may be observed in large herds.



FIG. 33.—Head and Antlers of Common Fallow Deer. (Rowland Ward, *Records of Big Game*.)

As already mentioned, a bez-tine may occasionally be developed on the antlers, and another abnormality is the presence of an additional tine on the front edge immediately above the trez.¹

The antlers make their first appearance in the stags in the second year, when they are in the form of simple snags, the animal being then known as a pricket. In the third year the brow- and trez-tines show themselves, while the extremity of the beam becomes palmated. In the succeeding year the palmation increases, with strongly marked serrations on the hinder

¹ See Brooke, *Nature*, vol. xi. p. 210 (1874).

border ; and in the fifth season the antlers have attained nearly their full dimensions, although the palmation and its posterior snags do not reach their complete development till the succeeding season. The antlers are shed somewhat earlier in the spring than those of the red deer.

Mr. Rowland Ward gives the following dimensions of fallow deer antlers :—

Length on Outer Curve.	Basal Circumference.	Tip to Tip.	Spread inside.	Number of Points.	Width of Palmation.
30	$4\frac{3}{4}$	$23\frac{1}{2}$	$26\frac{1}{2}$	10-9	$4\frac{1}{2}$
$29\frac{1}{2}$	5	17	$28\frac{1}{2}$	14-13	$7\frac{1}{4}$
29	$4\frac{1}{8}$	$30\frac{1}{2}$	$24\frac{1}{8}$	10-11	$5\frac{1}{2}$
$28\frac{1}{2}$	4	$14\frac{1}{2}$	26	10-11	6
$27\frac{3}{4}$	5	$20\frac{1}{2}$	$21\frac{1}{2}$	13-7	$5\frac{3}{4}$
$27\frac{1}{4}$	4	23	?	10-8	?
$26\frac{7}{8}$	$3\frac{3}{4}$	12	$17\frac{1}{2}$	7-10	?
$26\frac{1}{2}$	$4\frac{1}{4}$	$23\frac{1}{2}$	$20\frac{1}{2}$	7-9	$5\frac{7}{8}$
26	5	$20\frac{3}{4}$	$23\frac{3}{4}$	10-10	$4\frac{1}{2}$
$25\frac{1}{2}$?	?	26	?	$5\frac{1}{4}$
$25\frac{3}{8}$	$4\frac{1}{4}$	26	?	8-8	$5\frac{1}{8}$
25	4	$24\frac{3}{4}$	$25\frac{3}{4}$	11-10	$5\frac{3}{4}$

The fallow deer of Epping Forest, which all belong to the uniformly brown breed and have reverted to an almost wild state, are remarkable for the narrowness of the palmation of the antlers, and since the same condition obtains in those of the skeleton of a wild specimen from Asia Minor in the British Museum, it might seem that this is the original form, and that the great width characteristic of the antlers of most British park herds is due to high feeding. But their dark pelage indicates that the Epping herd is a specialised breed ; and a pair of antlers in the palæontological gallery of the British Museum (No. M. 4104) obtained from Clacton, Essex, and said to be from a deposit of the polished stone age, are as broad as those of any modern park herd.

Distribution.—Southern Europe, namely Greece, Spain, Portugal, Anatolia, Rhodes, and Sardinia ; parts of Asia Minor, Northern Palestine, and North-Western Africa. In a semi-domesticated state in Great Britain, the south of Sweden, Italy, and Tasmania. Fossil in the Plistocene deposits of the Gibraltar caverns.

With regard to the occurrence of the species in North Africa, the

evidence is not as full as might be desired, although that region doubtless forms part of the habitat. Cuvier stated that wild fallow deer occur near Tunis, and this was confirmed by Gervais, who said that they are found in Barbary, Tunis, and Algiers, especially in the forest of Calle. Loche, in 1867, stated that he had seen a few specimens from the latter locality ; but M. Lataste, writing in 1885, was unable to obtain any further information with regard to them.

Since remains of fallow deer appear unknown in the peat of the English fens, it has been generally believed that the existing form has been introduced into the country from abroad ; the introduction being attributed to the Romans. The above-mentioned antlers from Clacton, if really of the age assigned to them, point, however, either to a much earlier introduction, or to the species being indigenous.

In Jenyns's *British Vertebrate Animals* it is stated that the dark brown breed was introduced into Britain by King James the First from Sweden (misquoted Norway in Bell's *British Quadrupeds*), but it has been shown¹ that this breed was living in Windsor Park soon after the middle of the fifteenth century, so that its introduction (if introduced it was) must have been at a much earlier date than the one given by Jenyns.

Habits.—Of the life of the wild fallow deer of the Mediterranean countries there seems to be but little recorded, nearly all the voluminous literature relating to park herds. The fallow deer is everywhere a thoroughly gregarious species, going about in large herds ; and in most British parks these herds while feeding graze in the open. In Epping Forest, however, Mr. J. E. Harting states that "they do not associate in one herd, but roam about in small parties, keeping to the thickest underwood and most unfrequented part of the forest. Consequently they are but seldom seen, and many people doubtless are unaware of their existence." For the greater portion of the year the bucks keep apart from the does, grazing in separate herds, but in early winter, as well as during the pairing-season, the two sexes are found in company. The pairing-season commences in September, by which time the antlers of the bucks are free from the velvet, and the young are born in the following June or July. As a rule, only a single fawn is produced, although twins occasionally occur. Mr. Harting was informed that the fawns of the brown breed

¹ See Harting, *Essex Naturalist*, vol. i. p. 52 (1887).

in Epping Forest are not spotted, but those of the same breed are dappled at Woburn, and I am told that faint spotting may be seen in Epping fawns. The old bucks lose their antlers in May, and only a short interval elapses before the new ones begin to bud. The date of changing the coat varies somewhat in different parks. The brown breed has the pelage darkest in summer, whereas in the spotted variety the winter coat is the darker.

Although subsisting to a great extent by grazing, fallow deer are fond of the leaves of most deciduous trees, and in autumn consume a considerable quantity of horse-chestnuts. To reach overhanging boughs they may frequently be seen raising themselves on their hind legs, and Bell states that the bucks will use their antlers to knock off horse-chestnuts. Their times of feeding vary according to the season. In winter, with the exception of a short mid-day rest, they graze most of the daylight hours ; but in summer, after feeding during the early morning, their period of repose lasts from between nine and ten till two, after which they are again usually on the move till about four. About this time they take another interval of rest, which lasts till near six, when they once more take a three hours' feed, after which they lie down for the night. During winter they require to be supplied with hay and corn. The only cry uttered by this species is a grunting bark. According to Jenyns, the terms buck, doe, and fawn are properly restricted to the two sexes and young of the fallow deer, the names stag, hind, and calf being those originally applied in the same senses to the red deer.

2. BROWN'S FALLOW DEER—*CERVUS BROWNI* (*Extinct*)

Cervus browni, Dawkins, *Quart. Journ. Geol. Soc.* vol. xxiv. p. 511 (1868), *Brit. Pleist. Mamm.* part vi., *Cervidæ* (*Mon. Pal. Soc.*), p. 17 (1887) ; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 89 (1885).

Cervus clactonianus, Falconer, *Pal. Memoirs*, vol. ii. p. 478 (1868).

Cervus dama browni, Dawkins, *Early Man in Britain*, p. 98 (1880).

(?) *Cervus savini*, Dawkins, *Brit. Pleist. Mamm. op. cit.* p. 11 (1887).

Characters.—Closely allied to the last, of which its describer states it may be only a variety. Antlers simpler, with the palmation smaller, the posterior series of snags wanting, and an additional tine on the front edge above the trez, which is only very rarely developed in the existing form.

The basal half of the antlers so closely resembles those of the latter that it would be almost impossible to differentiate specimens with the coronal half broken away.

Distribution.—Typically from the Plistocene deposits at Clacton, Essex, overlying the forest-bed. It does not appear, however, that the antlers from the latter deposit described as *C. savini* can be satisfactorily distinguished as representing a distinct species, on account of the still smaller development of the palmation. Not improbably this species, or race, indicates a transition towards the next.

3. THE MESOPOTAMIAN FALLOW DEER—*CERVUS MESOPOTAMICUS*

Cervus (Dama) mesopotamicus, Brooke, *Proc. Zool. Soc.* 1875, p. 265, 1876, p. 298.

Cervus mesopotamicus, Brooke, *op. cit.* 1878, p. 914; Fitzinger, *SB. Ak. Wien*, vol. lxxix. part i. p. 62 (1879).

Dama mesopotamica, Sclater, *List Anim. Zool. Gardens*, p. 171 (1883).

Characters.—Larger than *C. dama*; the colour much brighter (as bright as in the Indian spotted deer), the row of elongated white spots running on each side of the dark median line of the back in the former coalescing into a continuous band, and the black on the upper surface of the tail narrower and confined to its root. Antlers of a totally different type, being somewhat expanded at the origin of the trez-tine, which is large and situated some distance above the very short brow-tine, but at the summit are only somewhat flattened, and break up at the crown and summit of the posterior border into some four, five, or more snags.

The typical specimen was described in 1875, and in the following year Sir Victor Brooke figured several additional shed antlers, which, allowing for age, are all of the same general type as those of the former. In 1877 the Zoological Society of London received a living male (which subsequently bred with a hind of the common species), and in 1878 a female, while a second specimen of the latter sex was presented by Lord Lilford in 1881. The original pair bred together, although their progeny was unfortunately a female. Beyond this little appears to be known of this very interesting species. Fitzinger observes that "in my opinion this form is only a variety of the common fallow deer, and the figured antlers are apparently of an

abnormal type, such as frequently occurs in other species of deer." The general constancy of type of the antlers—peculiar as they are—figured by Sir Victor Brooke is sufficient to disprove this view, and to indicate that the Mesopotamian fallow deer is a perfectly distinct species. Additional specimens would, however, undoubtedly be most interesting. One of the



FIG. 34.—Head of Mesopotamian Fallow Deer. From a specimen in the British Museum.

figured antlers shows a duplication of the trez-tine. In addition to the type specimen, the British Museum possesses a flattened skin belonging to a buck with the antlers in a fairly advanced stage of development. It is from this specimen that the accompanying figure has been drawn, the head being now mounted in the Museum.

Distribution.—The mountains of Luristan, in Mesopotamian Persia.

4. THE GIANT FALLOW DEER —CERVUS GIGANTEUS (*Extinct*)

Alce gigantea, Blumenbach, *Beiträge Naturgeschichte*, 1st French ed. vol. ii. p. 407 (1803).

Cervus islandicus, de Blainville, *Journ. Physique*, vol. xciv. p. 261 (1822).

Cervus hibernus, Desmarest, *Mammalogie*, vol. ii. p. 446 (1822).

Cervus euryceros, Hibbert, *Edinburgh Journ. Sci.* vol. viii. p. 129 (1825); Pohlig, *Palæontographica*, vol. xxxix. p. 217 (1892).

Cervus megaceros, Hart, *Descript. Foss. Deer Ireland* (1826); Rütimeyer, *Abh. schweiz. pal. Ges.* vol. x. p. 108 (1883).

Megaceros hibernicus, Owen, *Rep. Brit. Assoc.* for 1843, p. 237 (1844), *Brit. Foss. Mamm. and Birds*, p. 444 (1846).

Cervus eurycerus, Giebel, *Fauna Vorwelt*, p. 145 (1847).

Cervus (Megaceros) hibernicus, Johnson, *Trans. Norfolk Soc.* vol. ii. p. 288 (1877); Ball, *Trans. Dublin Soc.* ser. 2, vol. iii. p. 337 (1885).

Cervus giganteus, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 82 (1885); Scharff, *Mém. Soc. Zool. France*, vol. viii. p. 453 (1895); Ward, *Records of Big Game*, p. 45 (1896).

Characters.—When fully developed, probably the largest of the brow-antlered deer, males standing fully 6 feet in height at the shoulder when in the flesh. Antlers very variable, but always with at least three tines on the front border, of which the one above the trez is the longest, the beam much expanded, and the brow-tine often flattened and bifurcated.

As represented by the Irish race—popularly but incorrectly known as the Irish elk—this splendid deer was first described just two centuries ago, an account of a skeleton being given by Dr. Molyneux in the *Philosophical Transactions* of the Royal Society for the year 1697. It was then regarded as indicating the former existence of the American elk in Ireland, the author prefacing his description with the following observation:—"That no real species of living creatures is so utterly extinct as to be entirely out of the world since it was first created, is the opinion of many naturalists; and it is grounded on so good a principle of Providence taking care in general of all its animal productions, that it deserves our assent."

Since that date skeletons and skulls have been dug up by hundreds in Irish bogs, while more imperfect remains have been discovered in many

other European countries. In Ireland remains of hinds are much less common than those of stags, and it was accordingly at first supposed that both sexes were antlered. Probably the cause of the much greater abundance of male skeletons is due to the antlers becoming entangled in roots or on snags, and thus preventing the carcasses from being washed away. To support the enormous weight of the antlers, the neck-vertebræ of the stags are of very large proportionate size. Although the beam of the antlers is very frequently directed at first outwards, the pedicles arise from a ridge on the skull in a nearly vertical direction after the manner of other species of

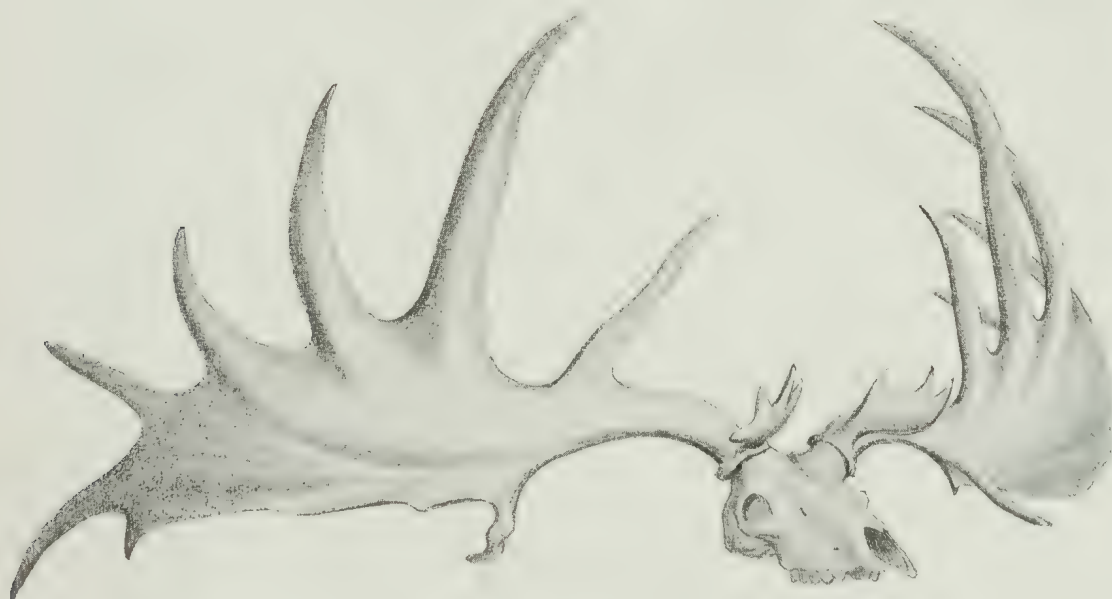


FIG. 35.—Skull and Antlers of Irish Race of Giant Fallow Deer. From a specimen in the British Museum.

the genus *Cervus*, so that there is no resemblance in this respect to *Alces*; from which the species also differs in regard to the lateral metacarpal bones of the fore-limb. In the presence of a brow, trez, supra-trez, and back-tine to the antlers, the species resembles Brown's fallow deer, to which animal the closest approximation is made by one variety of the German race, in which the antlers are directed more upwardly than usual, and the supra-trez is situated very high up (Fig. 36). Whether the giant fallow deer had a dappled summer coat like its living relatives, can, unfortunately, never be determined. The maximum development of the antlers occurring only in Western Europe, is a fact paralleled by the case of the red deer.

Distribution.—Ireland, Isle of Man, England, Scotland, Denmark, France, Belgium, Germany, Austria, Hungary, North of Italy, Russia, the Altai, and Siberia,¹ during the Prehistoric and Plistocene periods.

a. GERMAN RACE—*CERVUS GIGANTEUS RUFFI*

Cervus megaceros ruffi, Nehring, *SB. Ges. Naturf. Berlin*, 1891, p. 151 (1892), p. 3.

Cervus euryceros germaniæ, Pohlig, *Palæontographica*, vol. xxxix. p. 220 (1892).

Cervus ruffi, Lydekker, *Royal Natural History*, vol. ii. p. 365 (1894).

Characters.—Distinguished from the typical race by the smaller, narrower, and more upwardly directed antlers, in which the whole palmation is much curved inwardly, and the tines on the front border are much less developed, the one immediately above the trez not being markedly larger than the others. The specimens to which the name *ruffi* was originally applied (Fig. 36) have the antlers directed still more upwardly, with the plane of the palmation placed nearly in a longitudinal direction, and the tines above the trez situated near or at the summit. Although in all these respects this type makes a most decided approximation to the existing fallow deer, Dr. Pohlig has shown that it is merely an ultra-development of the form he calls *germaniæ*,—a name which must give place to the earlier *ruffi*. Although I formerly regarded the type of the latter as indicating a distinct species, more mature consideration leads to the conclusion that it would be most improbable to have two species inhabiting the same area (the typical *germaniæ* being undoubtedly a mere race of *giganteus*), and I accordingly adopt Dr. Pohlig's view.

Distribution.—Europe during the upper portion of the Plistocene and Prehistoric periods, remains of this form having been discovered in Germany, France, Belgium, England, Russia, and probably Siberia and Denmark. In geological age this race appears somewhat older than the following, its remains occurring in cavern and river deposits in company with those of the extinct cave-bear, whereas the Irish race is commonly found in association with remains of a variety of the brown bear and of the beaver.

¹ See Tcherski, *Das Janaland und die Neusibirischen Inseln Mém. Ac. St. Pétersbourg*, vol. xl. (1892).

b. IRISH RACE—*CERVUS GIGANTEUS TYPICUS*

Cervus euryceros hiberniæ, Pohlig, *Palæontographica*, vol. xxxix. p. 217 (1892).

Characters.—The antlers very large, with the beam above the origin of the brow-tine directed almost immediately outwards, the palmation enormously developed and situated almost in a horizontal plane;¹ the brow-



FIG. 36.—Skull and Antlers of variety of the German Race of the Giant Fallow Deer. *a*, burr ; *b*, brow-tine ; *c*, trez-tine ; *h*, back-tine ; *d*, supra-trez tine. (From Nehring.)

tine large, flattened, and generally forked ; and either four or five tines on the front edge above the trez, of which the one immediately above the latter (corresponding to the fourth tine of the wapiti) is the longest and stoutest of all.

The back-tine is situated almost immediately opposite the trez, and Mr.

¹ This is when the face is in the normal inclined position ; in the specimen here figured the skull is placed horizontally and the front edge of the antlers consequently thrown upwards.

Gordon Cameron has published a figure showing the almost exact correspondence in the position of the tines of this race and those of a Scotch red deer in which the bez-tine is wanting but the back-tine developed. Whether the fact of the tine immediately above the trez being larger in this form and the wapiti than either of the others is anything more than a curious coincidence, is very difficult to determine. The large tine in question corresponds to the one normally developed in the same situation in Brown's fallow deer, and very occasionally in the common fallow deer. Rarely the brow-tine is undivided and much bent down over the face.

A large series of antlers of this race are preserved in the British and the Dublin Museum ; the following dimensions being taken from Mr. Rowland Ward's book and Professor V. Ball's memoir :—

Length along Inside Curve.	Basal Circumference.	Tip to Tip.	Width of Palmation.	Number of Points.
?	10	11 ft. 6	$17\frac{1}{2}$	12-11
7 ft. $5\frac{1}{2}$	$12\frac{1}{4}$	11 „ 3	$19\frac{1}{4}$	17
5 „ $8\frac{1}{2}$	$9\frac{7}{8}$	10 „ 2	$19\frac{1}{4}$	19
?	?	9 „ 8	?	?
?	$14\frac{1}{4}$	9 „ 6	23	?
6 ft.	$13\frac{1}{2}$	9 „ 5	$21\frac{1}{8}$	13-15
?	?	9 „ 2	$15\frac{1}{2}$?
6 ft. $1\frac{1}{2}$	$8\frac{3}{4}$	8 „ $11\frac{3}{4}$	$17\frac{3}{4}$	10-13
?	?	8 „ 10	$13\frac{1}{2}$?
5 ft. $3\frac{1}{2}$	$8\frac{5}{8}$	7 „ 6	?	10-11

Distribution.—Ireland, and probably parts of Britain and Western Continental Europe in deposits belonging mainly to the Prehistoric period. This race is the culminating form of the species, both as regards the development of the antlers and its relative age. It certainly existed during the human period, and in Ireland commonly occurs in the shell-marl beneath the peat, although stated to be sometimes found in the peat itself.¹ Remains not improbably referable to this form have been discovered in the peaty mud near Newbury, Berkshire, and also in the marl below the peat at Maybole, Ayrshire.

With much apparent truth, Dr. Pohlig points out that the enormous dimensions and wide span of the antlers of this magnificent deer would seem

¹ See Boyd Dawkins, *Early Man in Britain*, p. 258.

to preclude its being an inhabitant of forests, and that it must apparently have dwelt in more or less open country, although the other races of the species may well have been woodland animals. The cause of its extinction presents a difficult problem.

It may be mentioned that as the name *C. hibernicus* is a synonym of *giganteus*, it cannot be employed in the sense proposed by Dr. Pohlig as the title of the typical race.

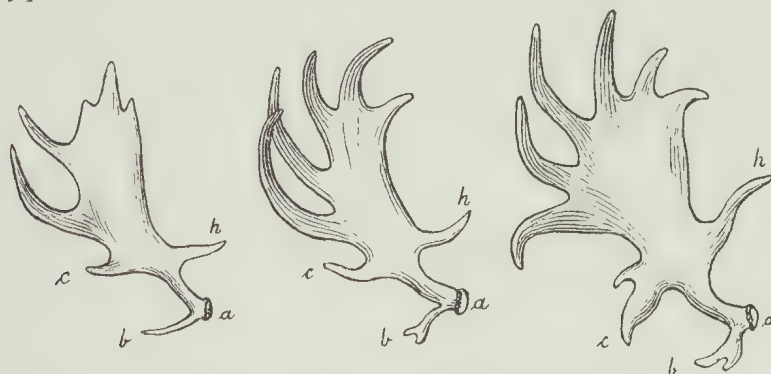


FIG. 37.—Antlers of Irish Race of Giant Fallow Deer at different ages. *a*, burr; *b*, brow-tine; *c*, trez-tine; *h*, back-tine. After Owen.

c. ITALIAN RACE—*CERVUS GIGANTEUS ITALIÆ*

Cervus euryceros italiae, Pohlig, *Palæontographica*, vol. xxxix. p. 228 (1892).

Characters.—Size relatively small; the antlers comparatively simple, with the palmation narrow, much inclined upwards, and the front border curved inwardly so that much of the outer surface is seen in a front view; all the tines being small, and those above the trez few in number and placed near the summit of the palmation.

Distribution.—Italy, Hungary, and probably other Mediterranean countries, in deposits of approximately equivalent age to those yielding remains of the German or northern race.

d. FRENCH RACE—*CERVUS GIGANTEUS BELGRANDI*

Cervus belgrandi, Lartet, in Belgrand's *La Seine*, vol. i. *Pal.* p. 13, plate xviii (1869).

Cervus euryceros belgrandi, Pohlig, *Palæontographica*, vol. xxxix. p. 232 (1892).

Characters.—Imperfectly known, but characterised by the rudimentary condition of the brow-tine, and the almost horizontal direction of the base of the beam of the antlers, of which the extremity is unknown.

Dr. Pohlig suggests that this race shows close affinity with the true elks, but this view I am not prepared to accept. He further points out that in the abortion of the brow-tine the antlers approximate very closely to those of the so-called *Cervus dawkinsi*, mentioned under the head of the next race, although he adds that the former come very close to those described as *C. verticornis*, with which they are contemporary in age.

Distribution.—Germany and France during the middle portion of the Plistocene period.

e. FOREST-BED RACE—CERVUS GIGANTEUS CARNUTORUM

Cervus megaceros carnutorum, Langel, *Bull. Soc. géol. France*, ser. 2, vol. xix. p. 711 (1862).

Cervus carnutorum, Dawkins, *Quart. Journ. Geol. Soc.* vol. xxviii. p. 409 (1872).

Cervus verticornis, Dawkins, *op. cit.* p. 406 (1872), *Brit. Pleist. Mamm.* part vi. *Cervidæ* (*Mon. Pal. Soc.*), p. 22 (1887); Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 92 (1885).

Cervus dawkinsi, Newton, *Vertebrata of Forest-bed*, p. 54 (1882), *Vertebrata of Pliocene Deposits*, p. 26 (1891); Dawkins, *Brit. Pleist. Mamm. op. cit.* p. 7.

Cervus gunnii, Newton, *Vertebrata of Forest-bed*, p. 57 (1882), *Vertebrata of Pliocene Deposits*, p. 28 (1891).

Cervus fitchii, Newton, *Vertebrata of Forest-bed*, p. 56 (1882), *Vertebrata of Pliocene Deposits*, p. 28 (1891).

Cervus euryceros carnutorum, Pohlig, *Palæontographica*, vol. xxxix. p. 233 (1892).

Cervus euryceros dawkinsi, Pohlig, *loc. cit.*

Characters.—Antlers stout, directed upwards and outwards, with the palmation generally slight, and the brow-tine large, simple, and inclined mainly downwards; higher up come the trez and the tine above it, while the crown apparently forms two or three points, with a back-tine on the posterior border.

Such is the typical *C. verticornis* of the Norfolk forest-bed, which I agree with Dr. Pohlig in regarding as inseparable from the earlier-named *C. carnutorum* from equivalent beds in France. The single antler from the forest-bed described as *C. dawkinsi* differs by the rudimentary condition of the brow-tine, and the greater palmation of the crown, which terminates in more points. As already mentioned, this type approximates in some respects to the French race, while in its greater expansion it indicates a transition towards the Irish race. As both types occur in the same geological horizon, Dr. Pohlig appears undoubtedly right in regarding them as mere individual variations of one and the same form. There can likewise be no question as to their near relationship with the more typical forms of *C. giganteus*, of which they indicate the ancestral stock. Whether they should be regarded merely as a race of that species, or as a separate species, may be a doubtful point, although I have provisionally adopted the view of Dr. Pohlig. In the case of extinct forms constituting a completely connected series, it seems advisable to regard sub-species in a somewhat wider sense than when dealing with recent animals.

Distribution.—England and France during the early portion of the Plistocene period.

IV. THE RUSINE OR SAMBAR GROUP—SUB-GENUS RUSA

Rusa, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 309 (1827), as a sub-genus; Gray, *List Mamm. Brit. Mus.* p. 179 (1843), *Cat. Ungulata Brit. Mus.* p. 205 (1852), *Cat. Ruminants Brit. Mus.* p. 76 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 354 (1873), lxx. part i. p. 279 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 900; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 45 (1881).

Axis, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 312 (1827), as a sub-genus; Gray, *List Mamm. Brit. Mus.* p. 178 (1843), *Cat. Ungulata Brit. Mus.* p. 212 (1852), *Cat. Ruminants Brit. Mus.* p. 79 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 354 (1873), lxx. part i. p. 264 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 907; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 44 (1881).

Hippelaphus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 178 (1846), as a sub-genus.

Hyelaphus, Sundevall, *op. cit.* p. 181 (1846) ; Gray, *Cat. Ungulata Brit. Mus.* p. 215 (1852), *Cat. Ruminants Brit. Mus.* p. 79 (1872).

Ussa (*Oussa*), Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 20 (1888).

Sambur, Heude, *op. cit.* pp. 20 and 41 (1888).

Melanaxis, Heude, *op. cit.* p. 47 (1888).

Characters.—Antlers rounded, three-tined, with both the bez (second) and trez (third) tines wanting, and the beam simply forked at the extremity. Pelage either uniform, or spotted, at all seasons and all ages, or intermediate between the two, without a light-coloured caudal disk, or black-bordered white area on the buttocks. Throat and neck often heavily maned ; ears usually large ; tail relatively long. Naked portion of the muzzle large, extending on to the upper surface of the face, and not constricted above its junction with the upper lip. The face-gland, or tear-pit, frequently very large and capable of complete eversion. Upper canines small or wanting ; upper molars tall-crowned, with a small additional column on the inner side. Size large, medium, or small.

By previous writers the Indian spotted deer has been invariably separated as a distinct sub-genus or genus (*Axis*), but its antlers are of essentially the same type as those of some forms of *Rusa* proper, and the latter are intimately connected with it through the Philippine spotted deer and the hog-deer. Indeed, by those writers who do not separate it sub-generically or generically as *Hyelaphus*, the latter species is referred alternately to *Rusa* and to *Axis*. Accordingly, the latter group is merged in the former, of which it doubtless represents a less specialised type.

It has been customary to regard the anterior or inner tine of the terminal fork of the antlers in this group as corresponding to the trez (third) tine of the red deer group,¹ but there seems no reasonable doubt that Mr. A. Gordon Cameron is correct in his view that the trez-tine is unrepresented in this group, as it also is in the rucervine group.

The simple form of the antlers indicates that the group is a generalised one. The original type would appear to be represented by the Indian spotted deer, or chital, in which the white spots are persistent at all ages and all seasons. A more advanced modification is displayed by the hog-

¹ Compare the figures in Sir Victor Brooke's monograph of the *Cervidæ*.

deer, in which the spots disappear in the adult during the winter. But the most specialised forms of all are the various kinds of sambar, in which the adult is uniformly coloured at all seasons, while even the fawn may have lost its dappling. It is probable that the group reached the Oriental region at a comparatively early epoch (remains of fossil species occurring



FIG. 38.—Frontlet and Antlers of Indian Sambar. From a specimen from Simrol, in the British Museum. (Rowland Ward, *Records of Big Game*.)

in the Pliocene strata of the Siwalik Hills), and that it has had no connection with the ancestors of any of the preceding groups since the early part of the Pliocene epoch, when it may have branched off from the sikine stock. Numerous remains from the Pliocene deposits of Europe have been assigned to the present group, but at least a considerable proportion of these seem rather to belong to sikas.

Distribution.—The Oriental region.

I. THE SAMBAR—CERVUS UNICOLOR

Cervus unicolor, Bechstein, *Allgem. Uebers. vierfüß. Thiere*, vol. i. p. 112 (1799); Blanford, *Fauna Brit. India—Mamm.* p. 543 (1891); Ward, *Records of Big Game*, p. 3 (1896).

Cervus albicornis, Bechstein, *loc. cit.* (1799).

Cervus niger, de Blainville, *Bull. Soc. philom. Paris*, 1816, p. 76.

Cervus aristotelis, Cuvier, *Ossemens Fossiles*, ed. 3, vol. iv. p. 503 (1825); Sclater, *Trans. Zool. Soc.* vol. vii. p. 350 (1871); Brooke, *Proc. Zool. Soc.* 1878, p. 901; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 103 (1885); W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 176 (1891).

Cervus leschenaultii, Cuvier, *op. cit.* p. 506 (1825).

Cervus (Rusa) unicolor, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 108, v. p. 316 (1827).

Cervus (Rusa) aristotelis, H. Smith, *op. cit.* pp. 110, 310 (1827).

Cervus jarai, Hodgson, *Gleanings in Science*, vol. iii. p. 321 (1831).

Cervus heterocervus, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 721 (1841).

Rusa jarya, Hodgson, *op. cit.* p. 914 (1841).

Rusa nepalensis, Hodgson, *loc. cit.* (1841).

Rusa heterocervus, Hodgson, *loc. cit.* (1841).

Rusa aristotelis, Gray, *List Mamm. Brit. Mus.* p. 179 (1843), *Cat. Ungulata Brit. Mus.* p. 205 (1852), *Cat. Ruminants Brit. Mus.* p. 76 (1872); Jerdon, *Mamm. India*, p. 256 (1867); Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 279 (1874); Sterndale, *Mamm. India*, p. 503 (1884).

Cervus Hippelaphus aristotelis, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 178 (1846).

Cervus (Hippelaphus) niger, Sundevall, *op. cit.* p. 183 (1846).

Cervus (Hippelaphus) leschenaulti, Sundevall, *loc. cit.* (1846).

Cervus (Hippelaphus) unicolor, Sundevall, *loc. cit.* (1846).

Rusa aristotelis nigra, Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 284 (1874).

Rusa aristotelis leschenaulti, Fitzinger, *op. cit.* p. 286 (1874).

Rusa aristotelis unicolor, Fitzinger, *op. cit.* p. 287 (1874).

Rusa aristotelis heteroceros, Fitzinger, *op. cit.* p. 289 (1874).

Characters.—Size typically large. Hair coarse and shaggy, the hairs on the back not distinctly banded with differently coloured rings ; colour of adult uniformly some shade of dark umber-brown, with chestnut or whitish on the inner side of the buttocks, and often on the under-parts and limbs ; young more or less uniformly coloured, or faintly spotted on the hind-quarters. Antlers large, stout, and very rugose, with the brow-tine generally long and making an acute angle with the beam, and the front or outer tine of the terminal fork forming the continuation of the line of the beam when there is any inequality in the length of the two tines ; the space enclosed by the antlers of opposite sides generally V- or U-shaped, although the tips of the antlers frequently are inclined inwards ; pedicles of antlers short. Ears typically large, but relatively shorter in the smaller races ; face-gland greatly developed, and capable of complete eversion ; neck and throat thickly maned ; tail comparatively long, and more or less bushy.

Few groups of deer are more difficult to understand than the various kinds of sambar ; and unfortunately the series of specimens in our museums is far too incomplete to render possible a decisive solution of the difficulty. This can only be done by the acquisition of an extensive series of examples with the localities fully authenticated. From time to time numerous examples of the group are exhibited in the Zoological Society's Menagerie, and many are now living in the park at Woburn Abbey ; but in too many instances such specimens are purchased from dealers without any definite information as to their place of origin, and they consequently rather increase than diminish the confusion.

Very different views have been entertained as to whether the various modifications of the sambar type indicate distinct species, or merely races of one very variable form ; the latter view being adopted by the late Mr. Blyth and subsequently by Mr. Blanford. My own observations lead to the belief that all the kinds in which the front or outer tine of the terminal fork of the antlers forms the continuation of the line of the beam, where there is any inequality in the length of the two, are but varieties of a single species. But, on the other hand, I am inclined to regard those forms in which the back or inner tine is situated in the direct line of the beam as representing a second specific type. Whether all the local modifications of the first type are truly indigenous forms, and therefore entitled to rank

as valid sub-species, is still an open question ; and I confess to a great difficulty in determining specimens of which the place of origin is unknown. In the case of hinds and stags without antlers, I believe it to be frequently a matter of impossibility even to determine to which of the two specific types they belong.

In the skull of the present species the nasal bones, when the animal is fully adult, develop a plate at the posterior expansion, which tends to grow over the lachrymal vacuity ; and in some of the smaller races—notably the Philippine—the extension is so great as to reduce the vacuity to a mere fissure.

Distribution.—The undulating or hilly wooded districts of a large portion of the Oriental region, namely India, Ceylon, Assam, Burma, the Malay Peninsula, Borneo, Siam, W. China, Hainan, Formosa, and the Philippines.

a. INDIAN RACE—CERVUS UNICOLOR TYPICUS

Plate X

Characters.—Size very large, the height at the shoulder reaching 5 feet 4 inches, or perhaps more. Antlers long, with the two tines of the terminal fork generally of approximately equal length, but if unequal, the front one usually the shorter (Fig. 38), and the hinder one arising from the posterior surface of the beam and not forming the continuation of the axis of the latter. Colour almost uniformly dark umber-brown, but tending to gray or yellowish in some individuals ; under-parts very little paler than the back, but the chin, inner portion of the buttocks, the lower surface of the tail, and the inner side of the upper-part of the limbs more or less distinctly chestnut ; hinds paler than the stags ; young reddish, probably with a black tail and dorsal band, but spots wanting even when newly born. Ears very broad, about equal to half the length of the head ; the latter fairly long, with a comparatively straight profile ; tail moderately bushy, and longer than the ear.

The following dimensions of antlers are taken from Mr. Rowland Ward's *Records of Big Game*, but Mr. Blanford mentions a larger pair, of which the length is 48 inches. Antlers vary enormously in girth, length, and span, the longest specimens being by no means the stoutest. Any



INDIAN SAMBAR, STAG AND HIND.

NATIONAL MUSEUM OF NEW ZEALAND

examples over 35 inches in length may be considered good ; even such dimensions being, I believe, never reached by the Malayan sambar.

Length along Outer Curve.	Circumference above Brow-tine.	Tip to Tip.	Widest inside.	Locality.
46 $\frac{1}{2}$	6 $\frac{3}{4}$	24 $\frac{1}{8}$	30 $\frac{7}{8}$?
45 $\frac{1}{8}$	6 $\frac{5}{8}$	17 $\frac{3}{4}$	32 $\frac{1}{8}$?
45	7 $\frac{3}{8}$	22 $\frac{1}{2}$	33 $\frac{3}{4}$	Central Provinces.
45	7 $\frac{1}{4}$	44 $\frac{7}{8}$?	Western Ghats.
44 $\frac{1}{8}$	7 $\frac{7}{8}$	44 $\frac{3}{8}$	45 $\frac{7}{8}$	Central Provinces.
44	?	34	?	„
44	6	9 $\frac{1}{4}$	24 $\frac{3}{4}$	„
43	7 $\frac{1}{2}$	35 $\frac{1}{2}$	38	Gwalior.
42 $\frac{3}{4}$	5 $\frac{3}{8}$	26	32 $\frac{1}{4}$	Central Provinces.
42 $\frac{1}{2}$ (Fig. 38)	6 $\frac{1}{4}$	15	27 $\frac{3}{4}$	Ghats of Simrol.
41 $\frac{7}{8}$	6 $\frac{1}{4}$	33 $\frac{1}{8}$	35 $\frac{1}{4}$	Western Ghats.
41 $\frac{3}{4}$	7	28 $\frac{1}{4}$	34 $\frac{3}{4}$?
41 $\frac{5}{8}$	7 $\frac{1}{8}$	31 $\frac{3}{4}$	36 $\frac{3}{4}$	Nepal.
41 $\frac{1}{2}$	6 $\frac{1}{4}$	30 $\frac{1}{2}$	36 $\frac{1}{2}$	Central Provinces.
41	6 $\frac{3}{4}$	18 $\frac{1}{2}$	29	„
40 $\frac{1}{2}$	5 $\frac{5}{8}$	33	37 $\frac{1}{4}$?

Out of a total of sixty-eight specimens catalogued by Mr. Rowland Ward in only seven does the number of points reach four, the extra tine in most cases being only developed on one side ; so that all such variations can only be regarded as abnormal sports.

Distribution.—India and Ceylon, probably extending eastwards as far as the Assam valley, where the range may be separated by the Bramaputra from that of the next sub-species, with which, however, it may intergrade in this district. The Ceylon form is a smaller animal than the one from the mainland. Sir Victor Brooke included Burma, Siam, and Hainan in the range of this race ; but, as suggested by Mr. W. L. Sclater, there can be no doubt that those countries should be included in the habitat of the Malayan sambar. Regarding its distribution in India, Mr. Blanford remarks that “the sambar ascends the Himalayas in places to 9000 or 10,000 feet, and is common on the summits of the ranges in Southern India and Ceylon. It is not common on alluvial flats, though it is occasionally found on them, at considerable distances from the hills. It is, of course, wanting in the treeless plains of the Punjab, Sind, and Western Rajputana.”

Till the name *unicolor* was revived by Mr. Blanford, the sambar was very generally known as *C. aristotelis*. Concerning the reasons for the rejection of the latter name that author writes as follows :—"This fine deer appears to have been first mentioned by Pennant, who described it as the middle-sized and greater axis (*Cervus axis unicolor* and *C. axis major* of Kerr). To these forms the names of *Cervus unicolor* and *C. albicornis* were applied by Bechstein. Cuvier, in the second edition of his *Ossements Fossiles*, named different varieties *C. hippelaphus* and *C. equinus*, and two years afterwards added the names of *C. aristotelis* and *C. leschenaultii*, given to horns only. Why the name *C. aristotelis*, given to an abnormal horn, has been preferred for the Indian sambar it is difficult to say. The name *C. unicolor*, employed by Hamilton Smith, is preferable on account of both priority and suitability, being an appropriate term for the only Indian deer with unspotted young."

Imperfect skulls and antlers of a rusine deer from the Plistocene deposits of the valley of the Narbada, India, have been provisionally assigned by myself to the sambar, of which they may indicate an extinct race. Other remains from the Pliocene formations of the Siwalik Hills not improbably belong to more or less closely allied extinct species.

Although sambar is the Hindustani name, and the one generally adopted by sportsmen, in Nepal the stag is known as jarao, and the female as jarai, and these latter terms are sometimes employed in sporting literature. Plate x represents a stag and hind living in the menagerie at Woburn Abbey in 1897.

Habits.—The life-history of the Indian sambar has been described by several authors, among whom may be mentioned the late Sir Samuel Baker¹ and Captain Forsyth.² Although both stags and hinds are not unfrequently found alone, sambar generally go about in small parties, varying in number from four or five to about a dozen. Their favourite haunts are rocky hills and ranges, which are well wooded, and thus afford abundance of shady retreats. From such covert sambar issue forth at evening to graze in any open grassy glades there may be in the neighbourhood, or to feed upon plantations of sugar-cane, cinchona, etc. The young shoots and leaves of trees, as well as various wild fruits, also form an important part of their diet. Whether feeding on the upland glades or the cultivated tracts lower down,

¹ *Wild Beasts and their Ways*, p. 408.

² *The Highlands of Central India*.

these deer always retire to the higher woods to pass the day ; and there select a lair well sheltered from the sun where grass is abundant. To obtain water they travel long distances, but there is some difference of opinion as to whether a daily drink is necessary to their well-being.

According to Sir Samuel Baker, a sambar does not attain its full development of body and antlers until ten years old. A remarkable peculiarity of this, and probably several of the other races of sambar, is that the antlers of the stags are not replaced annually. On this point Sir Samuel Baker says:—"They are not shed annually, but with great irregularity every third or fourth year. This has been established as a fact by those which have been for some years kept in confinement, and it is generally accepted by all natives who are experienced shikaris. During eight years' hunting in Ceylon, I killed a vast number of sambar throughout all seasons, and there was no particular month when the antlers were shed ; the deer were found with horns in every stage of growth, irrespective of periods or localities." Similar testimony is afforded by Messrs. Forsyth and Blanford, the former of whom states that he knew several individual stags which retained their antlers for successive years. In the plains of India the antlers are usually dropped in March, but not till about a month later on the spurs of the Himalaya. Among the stags at Woburn Abbey the antlers are shed annually, but the time of shedding in all the members of the group, and also in the chital, is very variable ; and the fawns may be dropped at any time of year.

In the plains of India the new antlers of those individuals in which the old ones have been shed are generally free from the velvet about September, and the pairing-season takes place during the months of October and November, although in the Himalaya it is stated by Brian Hodgson to be deferred till the spring. During the season in question sambar collect in larger parties than at other times of the year ; the old stags calling in the mornings and evenings and sometimes far on into the night. The call of the stags has been described as a loud and somewhat metallic-sounding bellow, and that of the hinds as a faint grunting low. In the pairing-season the stags stalk about with the tail erected, the muzzle stretched out, and the eye-pits so completely everted as to expose the pink mucous membrane with which they are lined. In the wild state the stags at this time seem to confine their attacks to members of their own species, on whom they

inflict frightful gashes with the long brow-tines of their antlers ; but in captivity they are dangerous to approach. In addition to the pairing-call, sambar utter a hissing kind of snort, frequently accompanied by a stamp of the foot, when alarmed by the presence of a leopard or tiger, or the approach of a human being.

The fawns in the plains of India are born during June and July, and it is but seldom that more than one is produced at a birth. As already said, they are entirely without spots.

Although extremely active, and capable of rushing down the steep side of a rocky cliff with great rapidity, sambar in the open display only a moderate degree of speed, and can be ridden down with comparative ease by a well-mounted man. They are, however, difficult to kill, and will carry wounds that would be fatal to many others of their kindred. Although coarse-grained, the flesh is well flavoured.

A large herd of sambar of various races is kept at Woburn Abbey, where they flourish well, although apt to get out of condition during the winter. The secret of success seems to be that they are kept in large open paddocks, devoid of covert. In Ireland, where they were tried some years ago by Lord Powerscourt, they were allowed to wander in the park, but failed to thrive. "It was a curious thing with the sambar deer," writes his lordship,¹ "and it was no doubt the cause of their death, that they would never come out of the thickets in the daytime. They unfortunately could not be taught that Ireland has not a tropical climate, and they used to skulk in the thickest covert they could find, out of the sun, all day, and only came out to feed at night, as they would in the jungles of Mysore, where I have seen them pursuing the same tactics. Of course by this unnecessary precaution on their part against the meridian rays they got chilled through, and eventually died." At Woburn sambar may be seen feeding at all hours of the day in the open.

b. MALAYAN RACE—*CERVUS UNICOLOR EQUINUS*

Cervus equinus, Cuvier, *Ossements Fossiles*, ed. 2, vol. iv. p. 45 (1823) ; Brooke, *Proc. Zool. Soc.* 1878, p. 901 ; Günther, *ibid.* 1880, p. 452 ; Ward, *Records of Big Game*, p. 7 (1896).

¹ *Proc. Zool. Soc.* 1884, p. 208.

NATIONAL MUSEUM OF MELBOURNE



MALAYAN SAMBAR.

Cervus malaccensis, F. Cuvier, *Hist. Nat. Mamm.* vol. i. plate x (1824).

Cervus (Rusa) equinus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 112, v. p. 310 (1827).

Rusa equina, Gray, *List Mamm. Brit. Mus.* p. 179 (1843); Jerdon, *Mamm. India*, p. 260 (1867); Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 290 (1874).

Axis pennanti, Gray, *List Mamm. Brit. Mus.* p. 179 (1843).

Cervus (Hippelaphus) equinus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 178 (1846).

Rusa equinus, Gray, *Cat. Ungulata Brit. Mus.* p. 210 (1852), *Cat. Ruminants Brit. Mus.* p. 77 (1872).

Rusa equina malaccensis, Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 294 (1874).

Rusa equina pennantii, Fitzinger, *l.c.* p. 296 (1874).

Cervus brookei, Hose, *Ann. Mag. Nat. Hist.* ser. 6, vol. xii. p. 206 (1893).

Plate XI

Characters.—Nearly as large as the typical Indian sambar; but the antlers generally shorter and thicker, with the hinder or inner tine of the terminal fork much shorter than the front or outer tine, and arising as a spur from the inner hind margin of the beam, of which the hinder tine forms the direct continuation; the brow-tine also in most cases relatively longer. General colour darker, approaching to black or slaty gray in old stags; generally a light ring round the eye; the ears rather smaller, often with a distinct white margin; the legs frequently light-coloured; and the tail much more bushy. Face comparatively long and straight. Very young fawns, at least frequently, distinctly or faintly spotted on the hind-quarters, the general colour being foxy red, with the tail and a line down the back blackish or black.

That this deer is not entitled to rank as a distinct species may, I think, be regarded as certain, although it appears to have good claims to sub-specific distinction. After remarking on its difference from the typical sambar, Sir Victor Brooke states that he has seen skulls and antlers from Siam which are intermediate between the Indian and the Bornean races. None have, however, ever come under my own notice from the countries to the east of the Bay of Bengal which resemble those of the Indian race. Although very

general constant, the form of antler described above is not absolutely so, Mr. Blanford possessing a Burmese skull in which the hind tine of the terminal fork is the longer on one side, and the front tine on the other; but even in the former case the antler is not of the type of that of *C. hippelaphus*.

More precise information is required with regard to the coloration of the young. In the writings of Messrs. Jerdon and Brooke all the sambar are



FIG. 39.—Frontlet and Antlers of Malayan Sambar. From a Burmese specimen in the British Museum. (Rowland Ward, *Records of Big Game*.)

credited with having unspotted young; and this view was followed by Mr. Blanford. A correspondent of the *Asian* newspaper, writing about the year 1892 or 1893, mentioned, however, that in Cachar sambar always produce spotted young, and I have some reason to believe that this is also the case in Burma. In 1893 Mr. C. Hose described a very young sambar fawn from Mount Dulit, in North Borneo, which he regarded as distinguishable from the present form on account of being spotted, and to which he applied the name *C. brookei*. In this specimen, which is now in the British Museum, the general colour is foxy red, with faint yellowish spots on the hind-quarters; the tail and a streak down the back being black. Another fawn in the Museum, also sent by Mr. Hose from Borneo, and labelled *C. equinus*, is of approximately the

same age, and shows a few very faint traces of spots on the hind-quarters. In the skin of a third and somewhat older fawn in the Museum, likewise sent by the same gentleman from Borneo, the spots are wanting, and the head and neck have begun to assume the adult grayish colour. Probably the spots have disappeared. A spotted fawn was born at Woburn Abbey in January 1898.

Mr. Hose's original description of his presumed species is as follows, viz. :—

“General colour of the fawn rufous, browner on head, neck, and shoulders, richer on the posterior back, fore-limbs from elbows downwards, thighs, and outer sides of hind-limbs. Muzzle and sides of face brown; forehead and crown rufous. Ears externally dark blackish brown, edged with pale rufous, internally whitish. Back with an indistinct mesial blackish line. Shoulders and rump spotted, the spots small, yellowish, few in number on the shoulders, more numerous on the upper side of the rump. Inner sides of limbs, both fore and hind, and belly whitish, with a strong suffusion of rufous, especially towards the feet. Chest between the fore limbs deep shining black, this colour extending backwards along the lower part of the sides, where it is divided in the centre by the whitish or yellowish belly-colour. Middle of metatarsals with an elongated tuft of rich rufous hairs, tipped with black. Feet rufous, without black markings.”

He adds that the young differs from the typical *C. unicolor equinus* by being fully spotted, instead of being almost or quite unspotted; and also states that it does not show the same striking contrast between the deep black of the chest and tail and the brilliant rufous of the sides and rump. The latter differences, if constant, I should not regard as of even sub-specific value. And the cases cited prove that very young fawns of the Malayan sambar are frequently, if not invariably, faintly spotted.

The following dimensions of antlers are taken from Mr. Rowland Ward's book; the first five specimens in his list are, however, omitted, as being from Java, and thus apparently referable to *C. hippelaphus*.

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Locality.
$30\frac{1}{8}$	$4\frac{3}{8}$	$20\frac{3}{4}$	$21\frac{1}{4}$	Burma
$29\frac{3}{8}$	6	$16\frac{5}{8}$	$20\frac{3}{4}$?
$28\frac{1}{4}$	$4\frac{1}{2}$	$11\frac{1}{2}$	$12\frac{1}{2}$?
$26\frac{1}{2}$	$6\frac{3}{4}$	$24\frac{1}{2}$?	Perak
$23\frac{1}{8}$	7	$15\frac{3}{8}$?	Borneo
$19\frac{5}{8}$	$4\frac{1}{4}$	$16\frac{7}{8}$	$16\frac{7}{8}$?
$16\frac{1}{4}$	$4\frac{1}{4}$	$5\frac{5}{8}$?	Perak

Distribution.—Apparently ranging from Assam and Cachar through Burma and the Malay Peninsula to Siam, Hainan, Borneo, and, it is said, Sumatra. The reasons for regarding the Burmese sambar as referable to this and not the preceding race have already been given. There are antlers

from Assam in the British Museum showing all the characteristics of the present race ; and the aforesaid occurrence of sambar with spotted young in Cachar shows that the form from that district does not belong to the typical Indian race.

In respect to habits this race probably shows no important difference from the preceding.

c. FORMOSAN RACE—*CERVUS UNICOLOR SWINHOEI*

Rusa swinhoii, Sclater, *Proc. Zool. Soc.* 1862, p. 152, *Trans. Zool. Soc.* vol. vii. p. 333 (1871) ; Gray, *Cat. Ruminants Brit. Mus.* p. 77 (1872).

Cervus swinhoii, Brooke, *Proc. Zool. Soc.* 1878, p. 901 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 178 (1891).

Rusa swinhoei, Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 298 (1874).

Cervus swinhoei, Ward, *Records of Big Game*, p. 8 (1896).

Characters.—Very closely allied to the preceding, from which it may be distinguished by its shorter head and concave profile, the relatively longer legs, and the undermentioned differences in colour ; the stature being somewhat less. In the winter pelage the general colour of the upper-parts is uniform reddish black-brown, the head and ears being reddish yellow-brown, and the upper surface of the nose having a V-shaped blackish brown mark reaching to the eyes ; the under surface of the body is nearly as dark as the back, but the inner side of the thighs and the whole lower legs are brownish or whitish yellow, and the bushy tail is black all round. In the summer coat the general colour is light yellowish red-brown, darker in front than behind, and lightest on the under surface. The antlers are of the type of those of the Malayan race, but smaller, the longest recorded length being just under 20 inches ; and the skull is very similar to that of the Luzon race.

In his description Mr. Sclater remarked that this deer was very similar to the Malayan race, from which he was unable to point out distinctive differences, having never seen an adult of the latter. A short face and concave profile are stated by Sir Victor Brooke to be characteristics of red and fallow deer living under unfavourable conditions ; and in the case of the present form the same features may be due to the comparatively small area of its habitat. Indeed, it seems highly probable that the Malayan,

Formosan, and Szechuan races of the sambar will eventually have to be included under a single sub-specific title.

Mr. Swinhoe states that the young, when about half-grown, "is reddish brown, with the tail bushy and black, but reddish at its root; sides of the body paler, and the belly blackish brown; legs pale towards the hoofs, the latter black; under surface of tail, abdomen, and inner sides of hind-legs down to middle of shank yellowish white, the breast and belly being blackish brown; under surface of head and neck mottled whitey-brown;



FIG. 40.—Formosan Sambar, from a male at Woburn Abbey. Photographed by the Duchess of Bedford.

crown of the head, with many of the hairs, tipped with black; from the occiput a dark line runs down to the base of the tail; ears blackish brown, tipped and margined with ochreous white, and whitish on their insides." It is not known whether the very young are spotted; if they are not, there would be a distinction from the preceding race.

Distribution.—The island of Formosa. The type specimen was presented to the London Zoological Society in 1862, and is now in the British Museum. The society subsequently received three other examples, the last in 1868. Recently two examples apparently referable to this form were imported by a London dealer, one of which was sold to the Paris Zoological Gardens, while the second is living in the park at Woburn

Abbey, and shows all the characteristics of the type. It is the latter that forms the subject of Fig. 40.

Habits.—It is to the present race that the Chinese apply the name of four-eyed deer, on account of its power of everting the large face-glands. Mr. Swinhoe states that “in the central ranges of Formosa, near Mount Morrison, this brown deer is very common; and on a visit I paid to the wild tribes of these parts in February 1866, I found them hunting the deer with dogs. A place is cleared in the forest, where a party of men hide armed with matchlocks; the dogs yelp after the deer and drive them into the open, where the hidden sportsmen get easy shots at them.” There appears to be nothing recorded as to the breeding habits.

d. SZECHUAN RACE —CERVUS UNICOLOR DEJEANI

Rusa dejeani, Pousargues, *Bull. Mus. Paris*, 1896, no. 1, p. 2.

Cervus dejeani, Ward, *Records of Big Game*, p. 22 (1896).

Characters.—Described as being very similar to the Formosan race, but as large as the Indian sambar; the colour being a more sombre brown than in the latter, and the tail longer and more bushy. It is stated to be in all probability only a larger continental form of the Formosan sambar, and would accordingly appear indistinguishable from the Malayan sambar, with which it is not compared by its describer. In the type and only known specimen, which is preserved in the Paris Museum, the length of the antlers is $30\frac{1}{2}$ inches, and the basal circumference $5\frac{1}{2}$ inches. As already said, it is highly probable that this and the two preceding forms should be classed as one sub-species.

Distribution.—The province of Szechuan, North-Western China, about 30° north latitude. The distribution is interesting, as being the most northerly recorded for the sambar, or indeed for any member of the rusine group. The habitat serves in some degree to connect the distributional area of the Malayan with that of the Formosan race; and it is probable that this race will be found to intergrade with the former in the Yunnan district.

e. LUZON RACE—CERVUS UNICOLOR PHILIPPINUS

Cervus mariannus, Desmarest, *Mammalogie*, vol. ii. p. 436 (1822); Brooke, *Proc. Zool. Soc.* 1877, p. 53, 1878, p. 901.

Cervus (Stylocerus) philippinus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 147, v. p. 319 (1827).

Cervus (Rusa) marianus, H. Smith, *op. cit.* pp. 304, 311 (1827).

Cervus philippinus, Fischer, *Synopsis Mamm.* p. 622 (1829); Brooke, *Proc. Zool. Soc.* 1877, p. 51, 1878, p. 901.

Cervus (Hippelaphus) philippinus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 179 (1846).

Cervus (Hippelaphus) marianus, Sundevall, *op. cit.* p. 180 (1846).

Rusa philippinus, Gray, *Knowsley Menagerie*, p. 63 (1850), *Cat. Ungulata Brit. Mus.* p. 211 (1852).

Rusa paradoxa, Brehm, *Zool. Garten Hamburg*, 1864, p. 11.

Rusa mariannus, Gray, *Cat. Ruminants Brit. Mus.* p. 78 (1872).

Rusa marianna, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 355 (1873), lxx. part i. p. 304 (1874).

Rusa philippina, Fitzinger, *op. cit.* lxxviii. p. 355, lxx. p. 306 (1874).

Ussa marianus, Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 40 (1888).

Cervus marianus, Ward, *Records of Big Game*, p. 9 (1896).

Characters.—Nearly allied to the two last. Height at shoulder about 28 inches; general build stout and massive, with the hind-quarters not specially elevated, and the form that of a small Malayan sambar. General colour of pelage rich ruddy brown, darkest on the back and lightest on the neck; forehead and cheek rufous fawn; a blackish streak starting from over each eye to form a median line down the face, which is separated by a pale band of fawn from a narrow moustache-like mark on the muzzle; under-parts uniformly brown; metatarsal gland forming a rufous spot much lighter than the rest of the leg; ears moderate, covered externally with short, close-set hairs. Antlers nearly similar to those of the Malayan race, being very massive, nearly straight, with a very long brow-tine, and the inner tine of the terminal fork markedly shorter than the outer one. Skull rather elevated in the nasal region, and the lachrymal vacuity large and triangular.

In a skull from the Marianne Islands in the British Museum, one of

the antlers of which is figured by Sir Victor Brooke on page 56 of the *Proc. Zool. Soc.* for 1877, the length from the occiput to the tip of the nasals is 10.5 inches, and the length of the antlers along the outer curve 18 inches. A Luzon skull in the Museum is of approximately the same size, with similar antlers.

The Luzon sambar is a very rare animal in collections, the British Museum possessing only a very few skulls, with antlers. The type of *C. philippinus* is preserved in the Paris Museum. Judging from the figure given by Sir Victor Brooke in his above-quoted paper of 1877 and from the skulls in the British Museum, in the shortness of the face and the shape of the antlers it appears to be very similar to the Formosan sambar, but it is a shorter, less "leggy" animal, with the distinctive moustache-like markings on the upper lip. That it is only a race of the sambar, I am fully convinced.

The so-called Marianne deer (*C. mariannus*) was considered by Sir Victor Brooke to be in all probability identical with this form; and the specimens in the British Museum leave no reasonable doubt in my mind that this view of the case is the true one. Now the Marianne or Ladrone Islands are of very small size, and situated more than twenty degrees east of Luzon, very nearly in the longitude of New Britain; and it seems inconceivable that any species of deer could naturally be found in islands of such a type situated almost in the heart of Polynesia. Sir Victor Brooke has indeed suggested that the Marianne sambar was introduced from Luzon by the Malays, and this explanation must, I think, receive definite acceptance. Unfortunately, the name *C. mariannus* antedates *C. philippinus*, but as the animal seems not to be native to the Mariannes, I think the latter name must be adopted. There is of course the possibility that even the Philippine race may be an introduced variety of the Malayan sambar.

Distribution.—The island of Luzon, at the northern extremity of the Philippine group; introduced into the Marianne Islands.

f. BASILAN RACE—*CERVUS UNICOLOR NIGRICANS*

Cervus nigricans, Brooke, *Proc. Zool. Soc.* 1877, p. 57, 1878, p. 902.

Ussa nigricans, Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 31 (1888).

Cervus steerii, Elliot, *Publ. Field Columbian Mus.—Zool.* vol. i. p. 72 (1896), *ibid.* p. 157 (1897).

Characters.—Smaller than the last, the height at the shoulder being from about 24 to 26 inches; the general build much more slender, with the hind-quarters much higher than the withers. General colour of pelage blackish brown, slightly tinged with rufous, the face, neck, and shoulders being almost black; no moustache-like markings on the muzzle; chin and under-parts and the inner surfaces of the thighs varying from dirty white to whitish brown, the white showing most on the front of the thighs; metatarsal gland generally not distinctly seen; ears oval, relatively small, and almost naked externally. Antlers moderately stout, somewhat curved forwards, with a very short brow-tine, and the hinder tine of the terminal fork not much shorter than the front one. Skull much depressed in the nasal region, and the nasal bones in fully adult individuals so much expanded as almost or completely to obliterate the lachrymal vacuity.

In a skull in the British Museum collected in Basilan by Mr. A. H. Everett, the length from the occiput to the extremity of the nasals is 9.5 inches, and that of the antlers measured along the outer curve 13.5 inches.

The species was founded upon a female from an unknown island in the Philippines, in which the lower portions of the legs are perhaps rather lighter than in other examples, and the metatarsal gland indistinctly visible as a light patch.¹ This specimen is in the British Museum. In the year 1890 the Museum received from Mr. E. L. Moseley a small male sambar-like deer which had been collected by Mr. J. B. Steere in Basilan, and has been for some years mounted in the mammal gallery, and labelled *C. nigricans*. From the comparatively small size of the antlers it is probably immature; and the only difference, apart from sex, between this and the type specimen is that in the former the front and outer side of the lower portion of the legs are slightly darker, and show no distinct light gland-patch. As mounted, it measures 25½ inches at the shoulder, and 27 inches at the rump. In its relatively high rump it accords with Sir Victor Brooke's "crouching aguti-like carriage" of the type specimen, and from actual comparison with the latter there seems no doubt that both belong to the same kind of animal, the nearly naked ears being a very conspicuous common feature. The antlers are strongly curved. Two skulls

¹ Both the legs and the gland-patch are made too light in Sir Victor Brooke's plate.

in the Museum collected by Mr. A. H. Everett in Basilan evidently belong to older animals, having the antlers larger, although of the same type.

In 1896 Mr. D. G. Elliot described a small deer from Basilan collected by Mr. Steere, by whom the British Museum mounted specimen was also obtained. The author states that "the specimen serving as the type, and which is the only one I have seen, is a fully adult male, and the horns, for their size, are heavy and rough. In shape they are very different from those of *C. philippinus*, the brow-antler being quite short, diverging rapidly to a point, and joining the beam at a sharp angle. The inner tine is of the same shape and about the same size as the brow-antler, and bends backwards and very slightly inwards. The burr is rather small, and but slightly larger than the beam in circumference. The latter is thick and straight, with little or no taper, the outer tine, which curves slightly inward, being simply the natural prolongation of the beam to a point. It is widest at the forking of the inner and outer tines.

"From *C. nigricans*, the present animal differs in the colour of the coat, which is much brighter than that of Sir Victor Brooke's species, and also by the form of the skull."

The author then gives details of the points of difference between the skull of his specimen and that of the typical female of the present form figured by Sir Victor Brooke, remarking that these are apparently too great to be due to sex alone.

In a subsequent communication Mr. Elliot adds the following :—"Last autumn, having had an opportunity to examine the type of *C. philippinus* in the Natural History Museum in the Jardin des Plantes, Paris, I ascertained that my new species was hardly comparable with it in any way save a similarity in the shape of the antlers; *C. steerii* is not much over half the size of *C. philippinus*, and differs also in the colour of the coat. In fact, it would seem to belong to quite another section of the group than that represented by *C. philippinus*. Besides the type, there were several other examples of the species in the Museum, but all of them, even the young animals, were much larger than the type of *C. steerii*. It would seem, therefore, that we must look for its near ally in some other species of Philippine deer, as yet unknown to me." It is also stated that in the Basilan sambar the metatarsal gland is not different in colour from the hair of the rest of the leg, that there are no dark moustache-like markings on

the upper lip, no dark streak down the back, and that the tail is dark all round.

Although the antlers appear somewhat straighter, I have no doubt, from the figure of the head, that the type of *C. steerii* is identical with the British Museum mounted specimen referred to *C. nigricans*, and since I cannot distinguish the latter from the type of that species, I have no hesitation in pronouncing *C. steerii* to be a synonym of *C. nigricans*. Indeed, all the specimens from Basilan agree in their small size and short brow-tine. Mr. Elliot states that his specimen measures 1 foot 10½ inches (22½ inches) at the shoulder, and 2 feet 8¼ inches at the withers, but the latter must obviously be a misprint for 2 feet 3¼ inches (27¼ inches); and this relatively high elevation of the hind-quarters is, as already said, a special feature in the description of the type of *C. nigricans*. The alleged differences in the skull I consider due to sex and age.

It is with some little hesitation that I include this tiny little deer as a sub-species of sambar, but since it has the same type of antlers and similarly coloured hair, it seems preferable to regard it as a very diminutive and short-eared race of that very variable species.

Distribution.—The island of Basilan, situated near the southern extremity of the Philippine group.

It is interesting to note that as Basilan is one of the smallest of the Philippine Islands, so the Basilan sambar is the most diminutive of all the deer to which the name sambar can properly be applied, it being a well-known fact that the larger species of mammals gradually diminish in size with the shrinkage in the size of their habitat. Although the creature is not larger than a roe, and has relatively smaller ears than its relatives of the larger Oriental islands and continent, yet, especially as regards its antlers, pelage, colour, and tail, it is essentially a sambar, and as such seems better placed as a sub-species than as a species.

Habits.—Dr. Steere writes that the Basilan sambar “was found occupying the higher parts of the island, in a country of steep, rocky ridges, covered thickly with timber and thick undergrowth. In the valleys were shallow streams. I took it rather for a mountaineer than a swamp-inhabiter, though the whole country was dripping with moisture at the time of my visit, and the higher lands in the Philippines are always the swampiest. . . . I noticed that all the deer procured in Basilan were closely alike in colour,

size, and character of horns. . . . I have an impression that the same differentiation of species of *Cervus* exists in the Philippines as I found so prominent in many genera of birds." All these traits are essentially those of a sambar. Its crouching, skulking gait and elevated hind-quarters have been already mentioned.

2. THE RUSA, OR JAVAN SAMBAR—*CERVUS HIPPELAPHUS*

Cervus hippelaphus, Cuvier, *Ossements Fossiles*, ed. 3, vol. iv. p. 40 (1825); Brooke, *Proc. Zool. Soc.* 1878, p. 903; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 179 (1891).

Cervus (Rusa) hippelaphus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 105, v. p. 309 (1827).

Cervus russa, Müller and Schlegel, *Verh. Ges. Nederl. Zool.* p. 217, plate xlv (1839-44).

Rusa hippelaphus, Gray, *List Mamm. Brit. Mus.* p. 179 (1843), *Cat. Ungulata Brit. Mus.* p. 209 (1852), *Cat. Ruminants Brit. Mus.* p. 77 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 355 (1873), lxx. part i. p. 312 (1874).

Cervus (Hippelaphus) hippelaphus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 178 (1846).

Cervus tunjac, Blyth, *Cat. Ind. Mus.* p. 151 (1863).

Characters.—General form, pelage, and coloration sambar-like, but the ears never very large, the tail thin, the hairs on the back banded with differently-coloured rings, and the under-parts, chin, and inner sides of thighs and buttocks more or less distinctly whitish. Size medium. Antlers comparatively slender and only moderately rugose, with the brow-tine of medium or short length, and making a large acute angle with the beam; the hinder or inner tine of the terminal fork much longer than the front or outer one, and forming the continuation of the beam, from the front or front-outer surface of which the front tine arises as an offshoot; the two antlers enclosing a more or less distinctly lyrate space. Young uniformly coloured.

Although included by Mr. Blanford among the synonyms of the sambar, the rusa, or Javan sambar, is undoubtedly entitled to rank as a separate species. Not only is there the marked difference in the form of the antlers,



MOLUCCAN RUSA.

NATIONAL MUSEUM OF NEW ZEALAND

as also the ringed hairs of the back and certain peculiarities of coloration, but the fauna of Java differs so remarkably from that of the other Malayan Islands and Peninsula, that on this ground alone there would be very strong reason for separating the rusa as a species. Although used by Horsfield and others for Indian varieties of the sambar,¹ the name *hippelaphus* has by



FIG. 41.—Skull and Antlers of Javan Rusa. From a specimen in the British Museum.

most other writers been restricted to the Javan animal. Whether it was applied by Cuvier to Javan specimens, I have no means of knowing, but have retained it in the usually accepted sense. In the case of specimens of which the locality is unknown, I find some difficulty in assigning them to their proper race, and a good series of examples with authenticated localities

¹ See Blanford, *Fauna Brit. India—Mamm.* p. 545.

is essential before finality can be reached in this respect. Sir Victor Brooke speaks of the various races as differing mainly in point of size ; but Fitzinger alludes to colour differences and the varying length of the hair on the neck and tail ; and examples living at Woburn display considerable differences in the former respect.

Distribution.—Java, Timor, Celebes, and the Moluccas, introduced into Mauritius.

a. JAVAN RACE—*CERVUS HIPPELAPHUS TYPICUS*

Characters.—Smaller than the Indian sambar, and of the approximate size of a red deer. Head of moderate length, with the facial profile nearly straight ; throat and neck of males with a well-developed mane ; ear broad, and less than half the length of the head ; tail only slightly longer than the ear, thinner than in the Malayan sambar, and ending in a tuft of thick coarse hairs. Antlers as described above, a pair in the British Museum having the front tine of the terminal fork nearly in the same plane as the hinder one. General colour of the upper-parts in summer pelage dark, grizzled, ochry-brown with a tinge of red, darker on the hind-quarters and thighs than elsewhere ; front of neck, chest, and under-parts varying from dirty white to brownish gray, and a dark reddish brown longitudinal streak on the front of the chest ; flanks shot with rusty brown, and frequently with a patch of that colour ; inner side and lower part of legs, as well as inner side of buttocks, dirty whitish ; chin, lips, and under surface of lower jaw whitish, with a brownish spot on the lower lip at the angle of the mouth ; inner surface of ear also whitish ; base of tail yellowish brown above and dirty white beneath, at or near the tip uniformly blackish brown. In winter the general colour of the upper-parts is more grayish brown ; the under-parts and inner surfaces of the upper portion of the fore-legs, thighs, and buttocks dirty yellowish white ; the tip of the lower jaw, the border of the upper lip, and the neighbourhood of the nose white ; a blackish spot beneath the angle of the mouth, and often a brownish band round the muzzle. In the female the streaks on the chest and the tail are somewhat lighter. The antlers are relatively long and stout.

Such is Fitzinger's description of this species, which accords fairly well with specimens mentioned under the head of the next form. The British Museum has no skins, two from Hainan labelled *C. hippelaphus* being

apparently referable to the Malayan sambar. The species has not been exhibited in the London Zoological Gardens since the year 1877.

Two stags apparently belonging to the present race now living in the menagerie at Woburn Abbey differ from the description given above in that the colour of the winter pelage is reddish tawny, with no pure white on the under-parts. As they have the large antlers characteristic of the race, this variation in colour may be analogous to that occurring in the larger races of sambar. As shown in the accompanying photogravure, they have



FIG. 42.—Javan Rusa, from a Male at Woburn Abbey. Photographed by the Duchess of Bedford.

a well-developed mane on the neck and throat, and a dark terminal tail-tuft. In the stag figured by Müller the general colour is similar to that of the specimen of the Moluccan race represented in plate xii. "Rusa," it may be observed, is the Malay term for all deer, and is consequently applied by the natives alike to the Malayan sambar and the present form, to which latter it may conveniently be restricted in natural history.

Distribution.—Java, introduced into Mauritius, and, it is said, Borneo. As indicating the extent to which the Malays have introduced deer into the various islands they frequent, it is interesting to note that on Horsburgh

Island, forming one of the Cocos-Keeling group, lying east of Northern Sumatra, Mr. W. H. Forbes¹ mentions the existence of a herd which are "a cross between the Javan rusa (*Cervus hippelaphus*) and the darker Sumatra species (*Cervus equinus*)."

b. MOLUCCAN RACE—CERVUS HIPPELAPHUS MOLUCCENSIS

Cervus moluccensis, Quoy and Gaimard, *Voyage Astrolabe—Zool.* vol. i. p. 133, plate xxiv (1830); Eydoux and Gervais, *Mag. Zool.* vol. vi. p. 26 (1836); Brooke, *Proc. Zool. Soc.* 1878, p. 904; Ward, *Records of Big Game*, p. 12 (1896).

Cervus russa moluccensis, Müller and Schlegel, *Verh. Nederl. Zool.* p. 212 (1839-44).

Cervus (Hippelaphus) moluccensis, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 179 (1846).

Rusa moluccensis, Gray, *Knowsley Menagerie*, p. 62 (1850), *Cat. Ungulata Brit. Mus.* p. 209 (1852), *Cat. Ruminants Brit. Mus.* p. 77 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 354 (1873), lxx. part i. p. 320 (1874).

Hippelaphus moluccensis, Heude, *Mém. hist. nat. emp. Chinois*, vol. iii. p. 94 (1896).

Plate XII

Characters.—According to Fitzinger, the Moluccan rusa may be distinguished from the Javan race by its inferior size, and especially the want of a distinct mane on the neck of the male, the tail having no distinct terminal tuft, and the hair on the neck being short. The antlers are relatively small, the build is low and stout, and the head large and thick.

The British Museum possesses the mounted skin of a male rusa formerly living at Woburn Abbey, and presented by the Duke of Bedford, which may be provisionally assigned to this race, although, as its place of origin is uncertain, the determination may be open to doubt. As mounted, it stands 3 feet at the shoulder; and is in the winter pelage. On the back the hairs are distinctly marked with alternate dark and light rings, giving the speckled appearance to this part of the pelage characteristic of the species. The

¹ *A Naturalist's Wanderings in the Eastern Archipelago*, p. 31.

general colour of the upper-parts is speckled rufous yellowish brown, passing into uniform sambar-like brown on the flanks, where the hairs are not ringed, and speckling is consequently absent. The face is short ; the ears are of moderate size, and sparsely haired externally, where they are white on the outer side of the base. The inner surface of the ears, a line on each side of the nostrils, the lower lip, chin, under-parts, and the inside of the thighs and buttocks are white or whitish ; the lower portion of the legs being whitish brown. The antlers differ from the pair belonging to



FIG. 43.—Moluccan Rusa. From a photograph by the Duchess of Bedford.

the Javan race in the Museum, figured on page 163, by the circumstance that the front tine of the terminal fork arises markedly from the outer side of the beam, instead of from the front ; but I have no means of knowing how far this difference is constant.

Distribution.—Celebes and the islands of Boru, Batchian, and Amboina in the Molucca group ; all these islands lying between Borneo and New Guinea, and having a fauna with a certain number of Australian types.

Sir Victor Brooke writes as follows concerning the occurrence of the rusa in these islands and Timor :—“ Deer resembling *Cervus hippelaphus* in

every particular excepting size are found in many of the islands in the Indo-Malayan and Austro-Malayan regions. How far these are the result of natural distribution, or how far their occurrence is attributable to artificial transportation, is now most difficult to decide. The best authorities on the fauna of the East Indies, Wallace, Schlegel, and Müller, are inclined to lean towards the latter alternative ; and it is, I think, certain that the introduction of many of the larger mammals (*e.g.* monkeys, pigs, and deer) into the islands of the Austro-Malayan region has been affected by the Malays, who, according to Wallace, are much given to taming animals and conveying them from island to island. At the same time, the existence of a species of *Felis* peculiar to Timor, and of the singular *Anoa depressicornis* in Celebes, seems to me to necessitate caution in accepting this solution as of universal application. I shall, therefore, for the present keep the references to *Cervus timoriensis* of Timor and *C. moluccensis* distinct."

Mr. Wallace¹ himself, who is much more confident about the introduction by human agency, writes as follows :—"The only Moluccan ruminant is a deer, which was once supposed to be a distinct species, but is now generally considered to be a slight variety of the *Rusa hippelaphus* of Java. Deer are often tamed and petted, and their flesh is so much esteemed by all Malays, that it is very natural they should endeavour to introduce them into the remote islands in which they settled, and where luxuriant forests seem so well adapted for their subsistence."

The question is one of extreme difficulty, to which there seems no possibility of giving a definite answer. So far as Celebes is concerned, the occurrence of the anoa and the babirusa renders it quite probable that a deer might also have obtained an entrance into the island. The Moluccas are, however, more essentially Australian ; but if the pigs found in Ceram and New Guinea are really indigenous, it is difficult to say that the deer might not be so likewise. On the other hand, recent researches tend to show that both Celebes and Timor belong to the Oriental, instead of the Australian, region ; the deep channel running to the east, instead of to the west of these islands. And this indicates a considerable probability that these deer may be indigenous.

Habits.—In Batchian Dr. Guillemard² writes that "the common

¹ *The Malay Archipelago*, p. 300.

² *Cruise of the 'Marchesa'*, p. 357.

Malayan deer was numerous in the forest and plantations of this part of the island. It furnishes a permanent livelihood to a tribe of Gilolo Alfuros, who have been settled in Batchian for many generations. Living for the most part in the hills, they kill and smoke the deer, and bring the meat into the villages for sale. We were fortunate enough to assist at one of their hunts, in which no other weapon but the spear is used. The side of a large ravine which had been partially cleared, and presented a confused



FIG. 44.—Antlers of a Moluccan Rusa in four successive years. From a photograph by the Duchess of Bedford.

jumble of fallen trees and low brushwood, was assigned to us as our post, and from the extensive view it commanded we were able later in the day to watch one run almost from start to finish, although at first the sport appeared to be successful in every direction but our own. At length a stag broke covert about 500 yards above us, and descended the slopes of the ravine, but shortly afterwards turned and made for the forest again. He was met by some of the hunters and driven back, but the dogs were now in full cry, and pressed him hard, the hunters meanwhile racing at

their utmost speed above, in order to prevent his regaining the jungle. He now altered his direction, and turned down once more towards us, but the fallen trees were so thick that the dogs gained rapidly on him. He made one more effort for his life by doubling, but it was too late, and in another moment the dogs and hunters had fairly run him down."

From this account it would appear that the ground frequented by the Moluccan rusa is of the same general nature as that favoured by the Indian sambar.

c. TIMORESE RACE—*CERVUS HIPPELAPHUS TIMORIENSIS*

Cervus timorensis, de Blainville, *Journ. Physique*, vol. cxiv. p. 267 (1822).

Cervus peronii, Cuvier, *Ossements Fossiles*, ed. 3, vol. iv. p. 46 (1825).

Cervus (Rusa) peronii, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 114, v. p. 311 (1827).

Cervus russa timoriensis, Müller and Schlegel, *Verh. Nederl. Zool.* p. 212 (1839-44).

Cervus (Hippelaphus) peroni, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 179 (1846).

Rusa peronii, Gray, *Knowsley Menagerie*, p. 63 (1850), *Cat. Ungulata Brit. Mus.* p. 211 (1852), *Cat. Ruminants Brit. Mus.* p. 78 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 355 (1873), lxx. part i. p. 317 (1874).

Cervus timoriensis, Brooke, *Proc. Zool. Soc.* 1878, p. 903.

Hippelaphus timoriensis, Heude, *Mém. hist. nat. emp. Chinois*, vol. iii. p. 51 (1896).

Characters.—In size about the same as the preceding race, but distinguished by the thicker hair on the neck, the more distinctly tufted tail, certain differences in coloration, especially on the face and rump, and the wider antlers. Fitzinger describes the coloration as follows:—The forehead is gray, the face and the eyebrows are dark blackish brown, the neck, the upper part of the flanks and the greater portion of the chest being of the same tint, the dark brown of the chest forming a long streak between the legs; the middle of the back is almost black; the under-parts and inner surface of the thighs are brownish or ochry yellow, passing into dirty white on the hinder portion of the abdomen; a band above the hoofs

being also of the same colour ; the lips and inner surface of the ear are white, as is also the inner surface of the buttocks ; the tail-tuft being dark blackish-brown. In the males a whitish streak runs from above the eye across the cheek to the side of the neck.

This deer has only once been exhibited in the London Zoological Gardens, a pair having been presented by Captain L. Brayley in 1864.



FIG. 45.—Undetermined Rusine Stag at Woburn Abbey. From a photograph by the Duchess of Bedford.

Distribution.—The islands of Timor, Semaó, and Kambing, forming the eastern extremity of the Sumatra-Java line. The observations with regard to a possible introduction by man given under the heading of the last race, apply equally in this case.

Undetermined Specimens

Here may be mentioned a pair of small dark-coloured rusine deer living in the menagerie at Woburn Abbey, whose antlers, as shown in the accompanying photograph, differ markedly from normal specimens of any

of the races of *rusa* or *sambar*. They have four points ; and in the figured example recall to a certain extent those of the *rucervine* group. The general similarity of these appendages in the two stags is decidedly against abnormality, although they may possibly be hybrids. They are certainly members of the present group ; but nothing is known as to their place of origin. The pedicles of the antlers were longer when young than at the time when the figure was taken, and it is possible these deer may prove to be the adult of *C. culionensis*.

3. THE PHILIPPINE SPOTTED DEER—*CERVUS ALFREDI*

Cervus alfredi, Sclater, *Proc. Zool. Soc.* 1870, p. 381 ; Brooke, *ibid.* 1877, p. 59, 1878, p. 902 ; Meyer, *ibid.* 1879, p. 666.

Axis alfredi, Gray, *Cat. Ruminants Brit. Mus.* p. 80 (1872).

Melanaxis alfredi, Heude, *Mém. hist. nat. emp. Chinois*, vol. ii. p. 47 (1888).

Characters.—Size relatively small, the height at the shoulder being about 28 inches ; build long and low ; face rather long. Hair less coarse and shaggy than in any of the preceding forms. Ground-colour of pelage of upper-parts of adult dark blackish brown, frequently with a deep black line along the middle of the back ; the whole body marked with a number of distinct whitish spots, forming a regular row on each side of the back, but less regularly distributed elsewhere ; under-parts, chin, lower lip, inner surface of buttocks and of upper portion of legs, as well as the front of the thighs, white ; young also spotted. Antlers supported on short pedicles ; apparently of the general type of those of the Malayan *sambar*, but relatively smaller, and with a shorter brow-tine ; good specimens are, however, not known. Ears short and rounded, about one-third the length of the head, almost naked behind ; face-gland fairly large ; no mane on neck ; tail rather short and thinly haired, with some white on the lower surface.

This very handsomely coloured little deer was first made known from a living male specimen presented to the Zoological Society in 1870, of which the skin is now preserved in the British Museum. A female was received by the Society in 1871, and its skin is now mounted in the same collection. The male first bred with the type female of the Basilan *sambar*, and subse-

quently with its own species. Beyond the progeny of those three animals, no other specimens have been exhibited in the Society's gardens. In the female skin in the British Museum the black line down the middle of the back is very conspicuous, but it is not noticeable in that of the male. Sir Victor Brooke regarded this species as closely allied to the Basilan sambar, which it resembles in its small, bare ears and its flattened skull. The tail and pelage are, however, quite unlike the sambar type, and the species should apparently be regarded as indicating a distinct modification of the group, not improbably related to the Indian spotted deer.

Distribution.—The islands of Samar and Leyte, on the eastern side of the centre of the Philippine group.¹

4. THE CALAMIANES DEER—*CERVUS CULIONENSIS*

Cervus sp., Elliot, *Publ. Field Columbian Mus.—Zool.* vol. i. p. 68 (1896).

Cervus culionensis, Elliot, *op. cit.* p. 157 (1897).

Characters.—A small uniformly brown deer, differing from all the preceding forms by the great length of the pedicles supporting the antlers, and the large relative size of the auditory bullæ at the base of the skull; these two characters affiliating the species to the Bavian deer and the hog-deer.

The original description states that the build of this deer is rather stout, with the hind-quarters elevated, the head being slender, with a rather long and pointed nose. The hair is somewhat coarse and stiff, especially on the flanks, where it is longest. The ears are relatively long, slightly rounded, and thickly haired externally; and the tail is rather bushy. As the antlers of the type were in velvet and not fully developed, their characters could not be given. The general colour of the upper-parts is uniform cigar-brown, with a tinge of ochry, but a black stripe of about an inch in width runs from the shoulders to the root of the tail; the latter being brown above and white beneath. The under-lip and chin are yellowish white, the chest, shoulder, and much of the under-parts purplish brown, with long white hairs intermingled, but the abdomen and inside of the thighs white, and

¹ See Meyer, *op. cit.*

the legs blackish brown, with a long narrowish white stripe on the front of the hinder pair. In the female the general colour is paler.

I only knew this deer from the description, but in addition to the peculiarities of the skull, the small size (height not given), thickly haired ears, and dark dorsal stripe seem to differentiate it from all the foregoing forms. And, from the analogy of the other island types, it seems *primâ facie* probable that the deer of the Calamianes would be a distinct form, especially as the fauna of that island is very distinct from that of the Philippines proper, and more nearly related to that of Palawan and Borneo.

Distribution.—The island of Calamianes, or Culion, on the western side of the centre of the Philippine group to the north of Palawan.

5. THE BAVIAN DEER—CERVUS KUHLI

Cervus kuhlii, Müller and Schlegel, *Verh. Ges. Nederl. Zool.* p. 223 (1839-44).

Cervus (Hippelaphus) kuhlii, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 179 (1846).

Rusa kuhlii, Gray, *List Osteol. Brit. Mus.* p. 68 (1847), *Cat. Ruminants Brit. Mus.* p. 79 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 355 (1873), lxx. part i. p. 300 (1874).

Cervus kuhlii, Brooke, *Proc. Zool. Soc.* 1878, p. 902; Ward, *Records of Big Game*, p. 11 (1896).

Characters.—A small uniformly coloured brown species, apparently nearly allied to the last, but without a dark line down the back.

Height at shoulder about 27 inches; build light and tall; face comparatively short. Hair moderately coarse and long; the hairs on the back ringed. General colour of adult pelage uniformly brown, apparently about the same tint as that on the back of the hog-deer; no dark line on the back, and the under-parts of a rather darker tint than in the latter; young also uniformly coloured. Antlers not much longer than the head, supported on relatively long pedicles; their general form similar to those of the Malayan sambar, but much thinner and less rugose, and the brow-tine very short. Skull differing from that of all the preceding forms, with

the exception of the Calamianes deer, by the great development of the auditory bullæ, which form marked projections on the inferior surface. Ears small and pointed, thickly haired externally ; tail moderately long and bushy ; face-gland small ; metatarsal tuft only slightly lighter than the rest of the leg ; no mane on the neck.

The type specimen of this little deer is preserved in the Museum at Leyden, and the British Museum possesses a mounted specimen, now much faded and in bad condition, which was received in exchange from the former establishment. Living examples have been exhibited years ago in the Zoological Gardens at Amsterdam. The species appears to be in many respects intermediate between the sambar and rusa on the one hand, and the hog-deer on the other.

Distribution.—The small Bavian, or Bawean Islands, lying between Borneo and Java.

6. THE PARA, OR HOG-DEER—CERVUS PORCINUS

Cervus porcinus, Zimmermann, *Species Zool. Geogr. Quadr.* p. 552 (1777) ; Brooke, *Proc. Zool. Soc.* 1878, p. 902 ; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 104 (1885) ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 178 (1891) ; Blanford, *Fauna Brit. India—Mamm.* p. 549 (1891) ; Ward, *Records of Big Game*, p. 10 (1896).

Cervus (Axis) porcinus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 119, v. p. 312 (1827).

Cervus (Axis) pumilio, H. Smith, *op. cit.* pp. 120 and 313 (1827).

Cervus pumilio, Fischer, *Synop. Mamm.* p. 621 (1827).

Axis porcinus, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 196 (1835) ; Jerdon, *Mamm. India*, p. 262 (1867) ; Sterndale, *Mamm. India*, p. 508 (1884).

Cervus (Hyelaphus) porcinus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 181 (1846).

Hyelaphus porcinus, Gray, *List Osteol. Brit. Mus.* p. 67 (1847), *Cat. Ungulata Brit. Mus.* p. 215 (1852), *Cat. Ruminants Brit. Mus.* p. 79 (1872) ; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 354 (1873), lxx. part i. p. 253 (1874).

Axis oryzus, Kelaart, *Prodr. Faun. Zeylan.* p. 83 (1852).

Hyelaphus porcinus pumilio, Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 258 (1874).

Cervus minor, Sclater, *List Anim. Zool. Gardens*, p. 169 (1883), nec *Axis minor*, Hodgson (1841).

Characters.—Allied to the preceding, but the antlers larger, the build longer and lower, and the summer pelage of the adult, as well as that of the young, spotted.

Height at shoulder ranging from about 25 to 29 inches; build heavy and low, with the legs short; face comparatively short; the hairs on the



FIG. 46.—Head of Hog-Deer.
(Rowland Ward, *Records of Big Game*.)

back not ringed, but with pale tips. General colour of adult pelage in winter rufous or yellowish brown, with a somewhat speckled appearance owing to the pale tips of the hairs; under-parts much darker; in summer the upper-parts paler and more or less spotted in the early part of the season with pale brown or white, the spots sometimes limited to one or two rows on each side of a dark stripe down the middle of the back; young fully spotted for about the first six months. Antlers supported on long pedicles, and of the same general type as those of the preceding species—that is to say, with the hinder, or inner, tine of the terminal fork the shorter, and the brow-tine relatively short—but of greater proportional length, being considerably longer than the head in fully adult individuals.

Skull structurally similar to that of the last, but much less compressed in front of the orbits, and the latter less prominent. Ears rather large, well haired externally, white internally; tail rather long, whitish beneath; face-gland small; metatarsal tuft slightly lighter than the rest of the leg; no mane on the neck or throat.

A pair of antlers of an immature hog-deer in the British Museum are almost indistinguishable from those of an adult Bavian deer. The following dimensions of the antlers are recorded by Mr. Rowland Ward:—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Locality.
21	$3\frac{1}{4}$	$15\frac{1}{4}$	Pegu
$20\frac{1}{2}$	3	$9\frac{1}{8}$	N.-W. Provinces
$20\frac{3}{8}$	$3\frac{1}{8}$?	Nepal
$19\frac{1}{2}$	$3\frac{1}{8}$	$13\frac{5}{8}$	N.-W. Provinces
$19\frac{1}{4}$	$3\frac{1}{8}$	$9\frac{1}{2}$	India
$19\frac{1}{5}$	$3\frac{1}{4}$	$16\frac{1}{2}$	Burma
$19\frac{1}{5}$	$3\frac{3}{8}$	$18\frac{3}{4}$	India
$17\frac{3}{4}$	$3\frac{1}{2}$	$9\frac{1}{4}$	Nepal
$17\frac{1}{5}$?	$9\frac{1}{4}$	India
$16\frac{7}{8}$	3	$10\frac{3}{8}$?
$16\frac{1}{2}$	$3\frac{3}{8}$	$14\frac{1}{8}$	Nepal

Doubts have been expressed as to whether the hog-deer is spotted in the adult summer pelage, and it is probable that many individuals are never so marked, and that in most or all the dappling disappears before the assumption of the autumn coat. Mr. Blanford states that he has watched the appearance of the spotted summer garb in several individuals for two or three successive seasons in the Calcutta Zoological Gardens, and the spotting has been very noticeable in specimens living in the park at Woburn Abbey, one of which is shown in the accompanying figure. Mr. Sclater regards the spotted hog-deer as a distinct species, under the name of *Cervus minor*. According, however, to Mr. Blanford, Hodgson's *Axis minor* is a synonym of the Indian spotted deer, and therefore if the spotted hog-deer were a distinct species or sub-species, it would require a new name. In Mr. Blanford's description the under-parts of the hog-deer are stated to be lighter in colour than the back, whereas, in the summer coat at least, they are much darker; this species and the preceding being almost the only deer besides the wapiti in which this peculiar type of coloration obtains.

Distribution.—India, throughout the Indo-Gangetic plain from Sind and the Punjab to Assam, thence through Sylhet to Burma and Tenasserim. Although it has been reported from the highlands of Central India and Bombay, it is very doubtful if the species ranges to any extent into Peninsular India, except that it may be found some distance up the larger tributaries of the Ganges. It has been reported from Madras, but apparently owing to the name hog-deer having been improperly applied to the Indian chevrotain and muntjac. In Ceylon it has been introduced into certain

districts. An antler from the Plistocene deposits of the Narbada valley has been tentatively assigned by myself to the para ; if the reference be correct, the species formerly had a larger range.

Habits.—The para, as this little deer is called in Hindustani, is essentially a dweller on open alluvial flats, where it generally prefers grass-clad plains, although occasionally found among tall trees. Shunning the dense and lofty grass-jungles which form the haunt of the Indian rhinoceros and buffalo, the hog-deer selects localities where the grass and bushes attain but a moderate height. In such spots it is to be met with abundantly, although

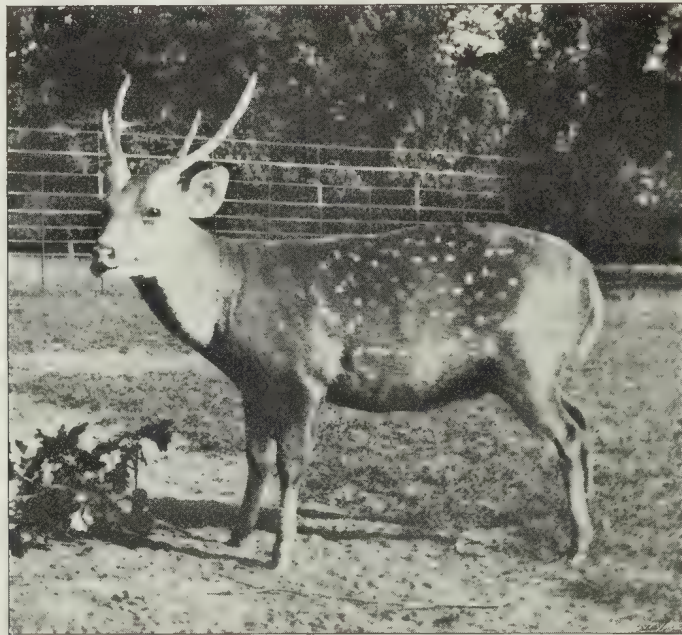


FIG. 47.—Male Hog-Deer in Summer Pelage. From a photograph by the Duchess of Bedford.
The light tint of the head and neck is due to the strong sunlight on these parts.

it is seldom that more than two or three are seen in company, as this animal is not of a sociable nature, and never collects in herds after the manner of its relative the spotted deer. Indeed, except during the pairing-season, even individual males and females keep apart from one another and lead a more or less completely solitary life. The pairing-season is in September and October, and the fawns are born eight months after. April is the usual month for shedding the antlers. In its movements the hog-deer is not a particularly graceful animal, running in an awkward-looking manner, with the head carried low. In captivity the bucks show great tameness, and walk with the head well elevated somewhat after the manner of a

NATIONAL MUSEUM, MELBOURNE



CRITAI OR INDIAN SPOTTED DEER

sambar, only with less aggressiveness, and without such constant dilatation of the face-glands, which are much smaller than in the latter. The species has bred both in the London Zoological Gardens and at Woburn Abbey.

7. THE CHITAL, OR INDIAN SPOTTED DEER—*CERVUS AXIS*

Cervus axis, Erxleben, *Syst. Regn. Animal.* p. 312 (1777) ; Brooke, *Proc. Zool. Soc.* 1878, p. 906 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 181 (1891) ; Blanford, *Fauna Brit. India—Mamm.* p. 546 (1891) ; Ward, *Records of Big Game*, p. 18 (1896).

Cervus (Axis) axis, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 117, v. p. 312 (1827).

Cervus axis ceylonensis, H. Smith, *op. cit.* vol. v. p. 786 (1827).

Cervus nudipalpebra, Ogilby, *Proc. Zool. Soc.* 1831, p. 136.

Axis major and *minor*, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 941 (1841).

Axis maculata, Gray, *List Mamm. Brit. Mus.* p. 178 (1843), *Cat. Ungulata Brit. Mus.* p. 212 (1852), *Cat. Ruminants Brit. Mus.* p. 80 (1872) ; Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 264 (1874).

Cervus (Hippelaphus) axis, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 180 (1846).

Axis maculatus, Jerdon, *Mamm. India*, p. 260 (1867) ; Sterndale, *Mamm. India*, p. 506 (1884).

Axis maculata ceylonensis, Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 269 (1874).

Axis nudipalpebra, Fitzinger, *op. cit.* p. 270 (1874).

Hyelaphus maculatus, Fitzinger, *op. cit.* 259 (1874).

Plate XIII

Characters.—Distinguished from all the other members of the group, except the Philippine spotted deer, by the pelage being profusely spotted with white at all seasons and at all ages. Size medium, the height at the shoulder varying from 36 to 38 inches ; build light and slender, with the legs long. Colour of pelage bright rufous fawn, spotted all over the body with white ; a dark stripe running from the nape of the neck to the

extremity of the tail, bordered along the back by one or two rows of white spots ; the spots low down on the flanks sometimes blending into a line ; the chin, upper portion of throat, inside of ears, the under-parts, inner surface of limbs, and under side of the tail white ; head uniformly brownish, darker on the face, with a blackish ring on the muzzle. Antlers supported on short pedicles, long, slender, and moderately rugose ; the brow-tine long and making nearly a right angle with the beam ; the front, or outer, tine of the terminal fork much longer than the hinder, or inner one, and forming the continuation of the beam, from the inner side of which the hinder tine



FIG. 48.—Antlers of a Chital in six successive years. From a photograph by the Duchess of Bedford.

arises ; space enclosed by the two antlers more or less distinctly lyrate ; sports, or irregular snags near the base of the brow-tine very frequently developed. Ears moderate ; tail long, pointed, and evenly haired throughout ; face-gland not excessively large ; no mane on either the neck or the throat.

The skull differs from that of the hog-deer by the normal size of the auditory bullæ on its lower surface. A dark variety, to which the name of *Cervus nudipalpebra* was given, is occasionally met with, and shows scarcely any indications of spotting ; but it has no apparent claim to rank as a distinct sub-species. The largest individuals occur in Northern and Central India, where the height of the stags commonly reaches to between 36 and

38 inches ; in Southern India the height is less, usually varying from 30 to 34 inches, although 36 has in one instance been recorded. It was to the small South Indian form that Hodgson gave the name of *Axis minor*. The shape of the antlers is exactly the reverse of that obtaining in the rusa. Those of the present species may be described as consisting of a brow-antler and a beam, the latter of which gives off an inner tine somewhere near the middle of its length ; whereas in the rusa the beam gives off an outer tine. On the other hand, in all the varieties of the sambar (*C. unicolor*) the beam may be described as more distinctly forked, although there is great variation in the relative length of its constituent tines. Ordinary specimens of chital antlers from North and Central India measure about 30 inches, and any examples over this length may be considered good ; in Southern India they are smaller. The following are some of the largest specimens recorded by Mr. Rowland Ward :—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Locality.
38 $\frac{1}{4}$	4 $\frac{3}{4}$	19 $\frac{1}{2}$	Central Provinces
37 $\frac{1}{2}$	4 $\frac{1}{4}$	24 $\frac{3}{8}$?
37 $\frac{3}{8}$	4	24 $\frac{1}{2}$?
37 $\frac{1}{4}$	4 $\frac{1}{4}$	16 $\frac{7}{8}$?
36 $\frac{3}{4}$	4 $\frac{3}{8}$	19 $\frac{1}{8}$?
36 $\frac{1}{2}$	4 $\frac{1}{2}$	25	Berar
36 $\frac{1}{2}$	4 $\frac{1}{2}$	15 $\frac{5}{8}$	Nepal
36	4 $\frac{1}{4}$	25 $\frac{1}{4}$?
35 $\frac{1}{2}$	4 $\frac{1}{4}$	18 $\frac{1}{8}$?
35 $\frac{3}{8}$	4 $\frac{5}{8}$	23	?
35 $\frac{1}{4}$	4 $\frac{1}{8}$	22 $\frac{7}{8}$	Western Ghats
35	4 $\frac{1}{2}$?	North Kanara

A still finer head is shown in Fig. 5, p. 31.

The reasons for including this species in the rusine group, instead of referring it to a separate group by itself, have already been mentioned. From the retention of the spots at all ages and seasons, the Indian spotted deer may be regarded as the most primitive and least specialised member of the whole group ; the long tail being probably also a primitive character. Many writers have considered the Indian spotted deer as nearly allied to the sikas ; but almost the only features common to the two are

the spotted coat and the length of the tail, both these having doubtless been inherited from the common early Pliocene ancestor. In the development of a trez-tine to the antlers, as well as in the tendency to lose the spots, and also in the black-bordered white caudal area, the sikas have departed from the ancestral type apparently retained by the chital.

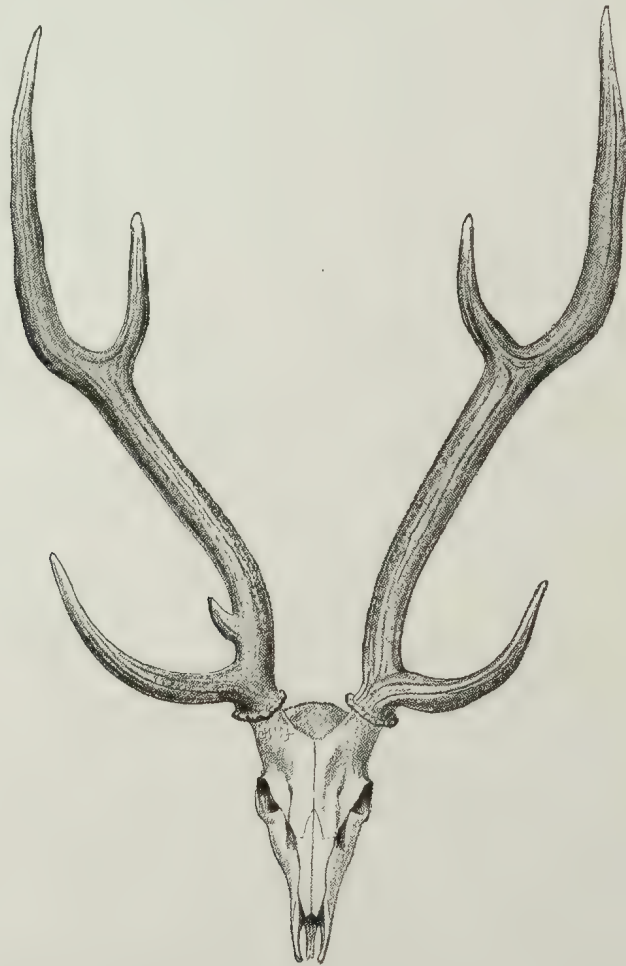


FIG. 49.—Skull and Antlers of Chital. From a specimen in the British Museum.
(Rowland Ward, *Records of Big Game*.)

Distribution.—Almost the whole of India and Ceylon. Mr. Blanford writes that this species “occurs at the base of the Himalayas, not, however, ascending the mountains beyond the lower spurs, from the neighbourhood of the Sutlej to Nepal, but not in Sikhim. It is not found in the Punjab plains, nor in Sind, and only to the eastward of Rajputana; it is wanting also in Assam and to the east of the Bay of Bengal, but is common in the Sandarbans, apparently as far east as Mymensing, through-

out Bengal and Orissa, the North-West Provinces, Central India, Mysore, Malabar, and Ceylon, in all suitable localities. It ascends the hills of Southern India, in places to about 3500 or 4000 feet."

Habits.—This species being the only distinctly spotted deer inhabiting India, it is natural that the natives of that country should have taken note of that feature in naming the animal; the Hindustani name chital, or chitra, meaning spotted, and being met with under the same or a nearly similar form in the vernacular title of the spotted soft river-tortoises (chitra), and the leopard (chita). This beautifully spotted coat renders the chital one of the most lovely members of the whole deer tribe; and it is not a little remarkable that almost all the countries of the Old World where deer are found have one spotted species or group, as if to remind us of the beautiful coloration which was doubtless formerly common to the entire family. In the Mediterranean countries we have the two species of fallow deer, in China and Japan the sikas, and in India the chital. Not only is the spotted deer one of the handsomest of all Indian mammals, but it is likewise one of the most characteristic, being, as already mentioned, unknown in the countries lying to the eastward of the Bay of Bengal, and having certainly been an inhabitant of the peninsula since the time when the latter was connected with Ceylon.

In marked contrast to the para, the chital is an essentially social species, congregating in herds, which sometimes include hundreds of individuals, and always at least one fully-antlered buck. Even in their native haunts they are much less exclusively nocturnal than the sambar, and may frequently be seen on the move for several hours after sunrise, and also some time before sunset; while when transported to English parks they will feed at any hour. The neighbourhood of water is essential to the well-being of this species, and if this be at hand, as well as covert for shelter, chital may be found either on the open plains or in hilly ground. Their partiality for water leads them to frequent spots where the foliage is of the most luxuriant; and no more beautiful sight can be witnessed in any part of the world than a herd of Indian spotted deer feeding on an open grassy glade dotted over with clumps of feathery bamboo by the side of a stream. Bamboo-jungle, and covert of other bushes and trees in the neighbourhood of water are, indeed, their favourite haunts; and if the covert is sufficiently dense and abundant, they display no marked aversion to the near neighbour-

hood of human beings and their habitations. When alarmed, the hinds are the first to make a move, racing off with a number of long flying leaps, very much after the manner of black buck ; after a short interval spent in gazing, they are followed by the lord of the herd. In feeding, they both graze and browse ; and after drinking sometime between eight and ten in the morning, they repose in the deepest shade accessible till the sinking sun proclaims it to be again time for wandering. As might be expected from their partiality for water, chital are excellent swimmers, and in the Sandarbans of Lower Bengal they may frequently be seen passing from one



FIG. 50.—Male and Female Chital. From a photograph by the Duchess of Bedford.

island or strip of land to another. In addition to a scream of alarm, these deer utter a peculiar half-barking cry. As is the case with the sambar, the shedding of the antlers is very irregular, stags with these appendages fully developed being met with at all times of the year. This implies corresponding irregularity in the breeding-season and the birth of the fawns, and although most of the latter appear to come into the world during the Indian cold season, some are produced at almost all times of the year. In spite of the warmth of its native home, the chital flourishes excellently in England, none of the deer at Woburn Abbey appearing in better condition than the herd of this species. Here the time of shedding

the antlers is very irregular, and the fawns may be dropped at any season, a single doe not unfrequently having two fawns in the same year. A buck born in December will usually shed his antlers in October, but one which came into the world in July will throughout life drop them in May or June.

An observer writing under the pseudonym of "Hawkeye" has given such a graphic account of chital in their native haunts that although it has been already quoted, it will bear another repetition. "Deep in the solitude of the woods," he writes, "see now the dappled herd, and watch the handsome buck as he roams here and there in the midst of his harem, or, browsing amongst the bushes, exhibits his graceful antlers to the lurking foe, who by patient woodcraft has succeeded in approaching his unsuspecting victim; observe how proudly he holds himself, as some other buck of less pretensions dares to approach the ladies of the group; see how he advances, as on tiptoe, all the hair of his body standing on end, and with a thundering rush drives headlong away this bold intruder, and then comes swaggering back! But, hark—a twig has broken! Suddenly the buck wheels round, facing the quarter whence the sound proceeded. Look at him now, and say, is he not a quarry worth the hunter's notice?"

"With head erect, antlers thrown back, his white throat exposed, his tail raised, his whole body gathered together, prepared to bound away into the deep forest in the twinkling of an eye, he stands a splendid specimen of the cervine tribe. . . . A doe suddenly gives that imperceptible signal to which I have formerly alluded, and the next moment the whole herd has dashed through the bamboo alleys, vanishing from sight—a dappled hide now and again gleaming in the sunlight as its owner scampers away to more distant haunts."

INCERTÆ SEDIS

1. *Cervus lepidus*

Cervus lepidus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 180 (1846); Brooke, *Proc. Zool. Soc.* 1878, p. 902.

Rusa lepida, Gray, *Knowsley Menagerie*, p. 63 (1850), *Cat. Ungulata Brit. Mus.* p. 212 (1852); Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 302 (1874).

Sir Victor Brooke observes that "this is a very doubtful species. Some years ago

I saw the type in the Museum at Frankfort ; and it appeared to me to closely resemble *Cervus sika*. Upon the occasion of my last visit to Frankfort, I sought in vain for the specimen, and much fear that it has been destroyed."

2. *Cervus caspicus*

Cervus caspicus, Brooke, *Proc. Zool. Soc.* 1874, p. 47, 1878, p. 909 ; Lydekker, *ibid.* 1897, p. 38.

This presumed species was named on the evidence of a frontlet and antlers obtained from the districts lying to the south-west of the Caspian. The type specimen, which was figured in 1874, was originally in the collection of the late Sir Victor Brooke but could not be discovered after his death. The antlers measure 26 inches in length along the curve, and are three-tined. In his original description Sir Victor Brooke referred the species to the rusine group, comparing it to *C. unicolor* and *C. hippelaphus* ; but in his memoir of 1878 it was placed provisionally in the sikine group, without any reference to the previous determination. The ground of this redetermination seems to rest upon another antler from the Karun valley, in the Luristan district of Persia, which may or may not belong to the same species as the type specimen. With regard to the latter, it appears, so far as can be determined from the figure, that the original determination was correct, and that the specimen is really rusine, the interval between the brow-tine and the terminal fork being much greater than the one between the brow-tine and the first fork of a sika's antler. From subsequent investigations, it is now nearly certain that neither a rusine nor a sikine deer inhabits the district of Persia in question ; and it appears highly probable that the type specimen belonged to the Indian or one of the allied races of sambar, and was imported into Persia.

3. Other Names

The following names have been applied by Heude (*Mém. hist. nat. emp. Chinois*) to specimens, mostly skulls, belonging to the present group. With regard to these I cannot do better than quote the following observations of Mr. D. G. Elliot,¹ who writes as follows :—"The paper is really of little assistance in determining the various species, and the author appears to have seen a new one in almost every example he procured, and unless one has access to the material in his possession, it will be practically impossible to recognise the animals upon which he has bestowed so great a list of names." The list runs as follows, viz.—

1. *Ussa gorrichanus*, vol. ii. p. 21 (1888) Philippines.
2. „ *barandanus*, „ p. 22 „ „

¹ *Publ. Field Columbian Mus. — Zool.* vol. i. p. 157 (1897).

3. *Ussa crassicornis*, vol. ii. p. 23 (1888) Philippines.
4. „ *francianus*, „ p. 24 „ „
5. „ *nublanus*, „ p. 24 „ „
6. „ *tuasoninus*, „ p. 25 „ „
7. „ *spatharius*, „ p. 25 „ „
8. „ *ramosianus*, „ p. 26 „ „
9. „ *ambrosianus*, „ p. 27 „ „
10. „ *macarianus*, „ p. 28 „ „
11. „ *elorzanus*, „ p. 28 „ „
12. „ *garcianus*, „ p. 29 „ „
13. „ *guidoteanus*, „ p. 29 „ „
14. „ *rosarianus*, „ p. 30 „ „
15. „ *maraisianus*, „ p. 31 „ „
16. „ *dailliardianus*, „ p. 32 „ „
17. „ *marzaninus*, „ p. 33 „ „
18. „ *roxasianus*, „ p. 33 „ „
19. „ *longicuspis*, „ p. 34 „ „
20. „ *microdontus*, „ p. 34 „ „
21. „ *gonzalinus*, „ p. 35 „ „
22. „ *telesforianus*, „ p. 36 „ „
23. „ *brachyceros*, „ p. 36 „ „
24. „ *corteanus*, „ p. 37 „ „
25. „ *verzosanus*, „ p. 37 „ „
26. „ *rubiginosus*, „ p. 38 „ „
27. „ *hipolitianus*, „ p. 39 „ „
28. „ *chrysotrichos*, „ p. 39 „ „
29. „ *quevaranus*, „ p. 40 „ „
30. *Sambur curvicornis*, vol. ii. p. 42 (1888) Cochin-China.
31. „ *longicornis*, „ p. 42 „ „
32. „ *outreyanus*, „ p. 42 „ „
33. „ *planidens*, „ p. 43 „ „
34. „ *colombertinus*, „ p. 43 „ „
35. „ *combalbertinus*, „ p. 43 „ „
36. „ *lignarius*, „ p. 44 „ „
37. „ *lemanus*, „ p. 44 „ „
38. „ *errardianus*, „ p. 45 „ „
39. „ *joubertianus*, „ p. 45 „ „
40. „ *latidens*, „ p. 45 „ „
41. „ *planiceps*, „ p. 45 „ „

42. *Sambur officialis*, vol. ii. p. 46 (1888) Cochin-China.
43. „ *simoninus*, „ p. 46 „ „
44. „ *brachyrhinus*, „ p. 46 „ „
45. „ *verutus*, „ p. 46 „ „
46. *Melanaxis masbatensis*, vol. ii. p. 47 (1888) Masbate.
47. „ *breviceps*, „ p. 48 „ „
48. „ *elegans*, „ p. 49 „ Ateneo.
49. „ *basilanensis*, „ p. 49 „ Basilan.
50. *Hyelaphus calamianensis*, vol. ii. p. 49 (1888) Calamianes.
51. „ *annamiticus*, „ p. 50 „ Annam.
52. *Hippelaphus hamiltonianus*, vol. iii. p. 49 (1896) Sundakan.
53. „ *macassaricus*, „ p. 50 „ Macassar.
54. „ *menadensis*, „ p. 50 „ Menado.
55. „ *floresianus*, „ p. 92 „ Flores.
56. „ *buruensis*, „ p. 93 „ Buru.
57. „ *hövellianus*, „ p. 94 „ „

V. THE RUCERVINE GROUP—SUB-GENUS RUCERVUS

Recurvus, Hodgson, *Ann. Mag. Nat. Hist.* ser. 1, vol. i. p. 154 (1838).

Panolia, Gray, *List Mamm. Brit. Mus.* p. 180 (1843), *Cat. Ungulata Brit. Mus.* p. 202 (1852), *Cat. Ruminants Brit. Mus.* p. 75 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 351 (1873), lxxix. part i. p. 591 (1874).

Rucervus, Gray, *List Osteol. Brit. Mus.* p. 65 (1847), *Cat. Ungulata Brit. Mus.* p. 303 (1852), *Cat. Ruminants Brit. Mus.* p. 75 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 355 (1873), lxx. part i. p. 324 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 905.

Characters.—Antlers flattened or rounded, with both the bez (second) and trez (third) tines wanting, the beam dichotomously forking, and one or both branches again forked, so that the number of tines is at least four, and may be many more, the brow-tine forming either a right angle or a continuous curve with the beam. Pelage of adult generally almost or quite uniformly coloured, without a light caudal disk; young usually spotted. Neck maned; ears large; face long; tail short. Naked portion of the muzzle of the rusine type, but decidedly narrower just above the upper lip. The face-gland moderate, and not capable of complete eversion.

Metatarsal gland small or wanting. Upper canines small ; upper molars with a small additional column on the inner side. Size large.

The skull is of very much the same type as that of the preceding group, but relatively narrower, with the auditory bullæ on the under surface only moderately inflated.

The group is evidently nearly allied to the rusine division, from which the more specialised form of the antlers suggests that it is a late development. Remains referred to this group have been described from the later Tertiary deposits of India, but beyond this nothing is known as to its palæontological history. Probably, however, it was developed in the Oriental region, and from its absence from the Malayan Islands not improbably at a date subsequent to the insulation of the latter.

Distribution.—The mainland of the Oriental region, but unknown in the islands with the exception of Hainan.

1. THE SWAMP-DEER—CERVUS DUVAUCELI

Cervus duvauceli, Cuvier, *Ossements Fossiles*, ed. 3, vol. iv. p. 505 (1825).

Cervus bahrainja, Hodgson, *Proc. Zool. Soc.* 1834, p. 99.

Cervus elaphoides, Hodgson, *Journ. As. Soc. Bengal*, vol. iv. p. 648 (1835).

Cervus (Recurvus) elaphoides, Hodgson, *Ann. Mag. Nat. Hist.* ser. 1, vol. i. p. 154 (1838).

Cervus dimorphe, Hodgson, *Journ. As. Soc. Bengal*, vol. xii. p. 807 (1843).

Axis (?) duvaucellii, Gray, *List Mamm. Brit. Mus.* p. 178 (1843).

Cervus (Hippelaphus) duvaucellii, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 178 (1846).

Rucervus duvaucellii, Gray, *List Osteol. Brit. Mus.* p. 65 (1847), *Cat. Ungulata Brit. Mus.* p. 203 (1852), *Cat. Ruminants Brit. Mus.* p. 76 (1872); Jerdon, *Mamm. India*, p. 254 (1867).

Rusa dimorpha, Gray, *Knowsley Menagerie*, p. 62 (1850); Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 355 (1873).

Cervus euceros, Gray, *Knowsley Menagerie*, p. 40 (1850).

Cervus eucladoceros, Falconer, *Pal. Mem.* vol. i. p. 587 (1868).

Cervus duvaucelli, Sclater, *Trans. Zool. Soc.* vol. vii. p. 346 (1871).

Rucervus duvaucelii, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 356 (1873), lxx. part i. p. 324 (1874).

Axis dimorpha, Fitzinger, *op. cit.* lxx. p. 272 (1874).

Cervus duvauceli, Brooke, *Proc. Zool. Soc.* 1878, p. 905 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 179 (1891) ; Blanford, *Fauna Brit. India—Mamm.* p. 538 (1891) ; Ward, *Records of Big Game*, p. 13 (1896).

Rucervus duvaucelli, Sterndale, *Mamm. India*, p. 510 (1884).

Plate XIV

Characters.—Height at shoulder from 3 feet 8 inches to 3 feet 10 inches ; build stout and tall ; hair moderately fine, and somewhat woolly ; muzzle



FIG. 51.—Side view of Frontlet and Antlers of Swamp-Deer. From a specimen in the British Museum.

long and slender. Antlers smooth and flattened, with a long brow-tine rising almost at right angles to the beam ; above the brow-tine the beam remains undivided for about half its length, when it splits into a regular fork, of which each branch is usually again simply forked, although, as in the specimen shown in Fig. 51, the outer branch may be much longer than the inner one, and bear three or more tines ; small snags are frequently developed on the upper surface of the brow-tine, although sports at its junction with the beam are seldom seen, and the brow-tine is never forked. Metatarsal gland and tuft wanting. General colour of pelage in summer bright rufous brown, frequently, or usually, with a broad brown line down the middle of the back, bordered by a line of white spots on each side, and more or less faint traces of other spots ; the throat, inner side of the thighs, and under-parts

white or whitish, and the lower surface of the tail invariably pure white ; in winter the upper-parts yellowish brown, and the under-parts paler ; in hinds the colour is lighter at all seasons, and the young are fully spotted



SWAMP-DEER.

NATIONAL MUSEUM, WASHINGTON

with white. The ears are filled internally with long white hairs ; and the naked portion of the muzzle is slaty.

The type specimen of Hodgson's *Cervus dimorphe* has been identified with this species by Messrs. Blanford and Thomas. The distinctive feature of the antlers is the distinct angle formed by the junction of the brow-tine with the beam, and the length of the undivided portion of the latter. Any antlers over 30 inches in length may be regarded as good specimens. The following are some of the largest measurements recorded by Mr. Rowland Ward :—

Length along Outer Curve.	Circumference.	Tip to Tip.	Widest inside.	Number of Points.	Locality.
41	5½	?	?	6-6	Central Provinces
39¼	5	35½	37½	5-6	India
38¼	6¼	?	?	6-5	Central Provinces
38	?	43	?	6-6	„
37¾	5¼	23⅝	28½	7-6	?
36½	5	20	?	23	Mavalla District
36	5	29¾	33¾	6-5	Nepal
35¼	5¾	22¼	?	7-6	„
35¾	4¾	27	29¾	?	?
34¾	5⅝	38¼	?	5-5	Central Provinces
34½	5½	24⅞	28⅞	6-5	Nepal

Distribution.—India, not extending to the eastward of the Bay of Bengal or to Ceylon. In India the range extends along the foot of the Himalaya from Upper Assam in the east to the Kyarda Dun west of the Jumna, throughout Assam, thence in a few localities in the Indo-Gangetic plain from the Eastern Sandarbans to Bahawalpur, and Rohri in Upper Sind, as well as here and there throughout the extensive area lying between the Ganges and Godaveri valleys as far eastwards as Mandla, the species being abundant in portions of the upper Narbada valley, as well as the neighbourhood of Bastar to the southward. As pointed out by the late Captain Forsyth, to whom we are indebted for the best account of its habits, the range of the swamp-deer in the Central Provinces corresponds with that of the red jungle-fowl, both species being exclusively confined to the tracts covered with forest of sal trees. The absence of the species from Ceylon confirms the opinion expressed above as to its being a comparatively modern type.

Habits.—Throughout the plains of India this species is commonly known as the barasingha, that is, twelve-tined deer, but as the same name is, incorrectly, applied in Kashmir to the hangul, it is preferable to employ the title swamp-deer, although, as pointed out by Mr. Blanford, that name is not entirely free from objection. As regards food, the swamp-deer is



FIG. 52.—Front view of Skull and Antlers of Swamp-Deer.
(Rowland Ward, *Records of Big Game.*)

mainly a grazing species, which makes it the more remarkable that its distributional area in Central India should be restricted to the limits of one particular kind of forest tree. Its favourite haunts are the outskirts of woods, or grassy plains dotted with trees; but in thick forest it is never seen, although it may be met with in open woods. As the cold season comes on, it collects in herds, which generally number from thirty to fifty

head, but in certain districts may include several hundred individuals. In the spring these herds break up, and as in Assam single stags may be found among long grass with their antlers in velvet at the end of March, it is presumed that the shedding must take place at least as early as February. Compared with the sambar, the swamp-deer is decidedly a more diurnal animal, as it may frequently be observed grazing late in the forenoon and again early in the afternoon, although it invariably retires to the shade for a mid-day rest. The pairing-season appears to commence about the latter part of October. Although this species has bred in the London Zoological Gardens, I have no information as to the usual breeding-time, or whether more than a single fawn is ever produced at a birth.

A writer quoted by Jerdon thus speaks of these deer in Central India : "The plain stretched away in gentle undulations towards the river, distant about a mile, and on it were three large herds of barasinghas feeding at one time ; the nearest was not more than five hundred yards away from where I stood ; there must have been at least fifty of them, stags, hinds, and fawns, feeding together in a lump, and outside the herd grazed three most enormous stags. . . . Then the herd went off in earnest, showing a perfect forest of antlers, and the clatter of their hoofs on the hard ground was like the sound of a squadron of cavalry going to water."

This deer has received its specific name in honour of the French naturalist Duvaucel, and it is not a little remarkable that such an amount of error should have crept into the spelling of the Latinised version.

2. SCHOMBURGK'S DEER—CERVUS SCHOMBURGKI

(?) *Cervulus cambojensis*, Gray, *Proc. Zool. Soc.* 1861, p. 138.

Cervus (*Rucervus*) *schomburgki*, Blyth, *Proc. Zool. Soc.* 1863, p. 155, 1867, p. 835.

Cervus schomburgki, Sclater, *Trans. Zool. Soc.* vol. vii. p. 349 (1871) ; Brooke, *Proc. Zool. Soc.* 1876, p. 304, 1878, p. 905 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 180 (1891) ; Ward, *Records of Big Game*, p. 15 (1896).

Rucervus cambojensis, Gray, *Cat. Ruminants Brit. Mus.* p. 76 (1872).

Rucervus schomburgkii, Fitzinger, *SB. Ak. Wien*, vol. lxxix. part i. p. 64 (1879).

Characters.—Height at shoulder about 3 feet 5 inches ; hair in winter rather long and coarse. General colour of pelage uniform brown, darkest on the nose and the upper surface of the tail, and lightest on the cheeks and flanks ; under-parts, lower surface of tail, and lower lip whitish ; a tinge of rufous on the upper lip, the back of the head, and limbs ; the hair on the front of the lower part of the fore-leg elongated to form a fringe. Antlers large, complex, smooth, and polished ; the brow-tine very long, frequently forked, and arising nearly at a right angle from the beam ; the



FIG. 53. -Front view of Frontlet and Antlers of Schomburgk's Deer. From a specimen in the British Museum.

beam very short and more or less laterally compressed, then forking dichotomously, with each of the main branches about equally developed, and again forking in a similar manner, to terminate in long cylindrical tines ; in immature males the hinder branch of the main fork is less developed than the front one.

This handsome deer is very rare in collections, although several fine pairs of antlers are exhibited in the British Museum. Never having seen an entire specimen myself, the foregoing characteristics are taken from Sir Victor Brooke's description of a mounted male skin in the Paris Museum,

brought from Siam in the year 1868. The chief point of distinction from the preceding species is the shortness of the beam of the antlers below the bifurcation, added to which is the frequent forking of the brow-tine, and the generally greater complexity of the antlers.

The following dimensions of antlers of this species are recorded by Mr. Rowland Ward, all the specimens except the fourth being in the British Museum :—

Length along Outer Curve.	Circumference.	Tip to Tip.	Widest inside.	Number of Points.
$30\frac{1}{8}$	5	$15\frac{5}{8}$	33	10-10
$29\frac{7}{8}$	$5\frac{1}{8}$	$23\frac{5}{8}$	$26\frac{7}{8}$	9-8
$29\frac{3}{4}$	$4\frac{3}{4}$	$28\frac{3}{8}$	$31\frac{5}{8}$	10-11
$28\frac{1}{2}$	$5\frac{1}{4}$	11	$29\frac{3}{8}$	11-9
$27\frac{7}{8}$	$5\frac{3}{8}$	14	$24\frac{1}{2}$	9-8
$27\frac{3}{4}$	$4\frac{3}{8}$	$18\frac{1}{2}$	$24\frac{7}{8}$	7-8

With regard to the name *C. cambojensis*, Dr. Gray wrote as follows : “On re-examination I am inclined to believe that the forehead and horns brought by M. Menhot from Cambojia, and named *Cervulus cambojensis*, are only irregularly developed horns of this species. The horns are short, thick, nearly straight, with a short, thick, recurved branch on the upper part of the front side near the base ; and on one of them there is a somewhat similar callosity on the hinder side at the same level.” The name “*cambojensis*” is the earlier, but since the species is said to be an inhabitant of Northern Siam, and to be unknown in Southern Siam and Cambodia, this appears to afford a sufficient bar to its employment.

Distribution.—The northern districts of Siam.

Two specimens only, both of which were stags, have been exhibited in the London Zoological Gardens, one received in 1873 and the other in 1880. The female appears to be unknown ; and there seems to be no record of the habits of the animal in the wild state.

3. THE THAMENG—CERVUS ELDI

(?) *Cervus smithii*, Gray, *Proc. Zool. Soc.* 1837, p. 45.

Cervus eldii, Guthrie (see Blyth, *Proc. Zool. Soc.* 1867, p. 837), *Calcutta Journ. Nat. Hist.* vol. ii. p. 417 (1842).

Cervus (Rusa) frontalis, M'Clelland, *Calcutta Journ. Nat. Hist.* vol. iii. p. 539 (1843).

Panolia acuticornis, Gray, *List Mamm. Brit. Mus.* p. 180 (1843).

Cervus lyratus, Schinz, *Synopsis Mamm.* vol. ii. p. 395 (1845).

Dama acuticornis, Reichenbach, *Naturgesch. Säugethiere*, vol. iii. p. 16 (1845).

Cervus (Hippelaphus) frontalis, Sundevall, *K. Vet. Ak. Handl.* for 1845, p. 320 (1847).

Panolia eedii, Gray, *List Osteol. Brit. Mus.* p. 66 (1847).

Panolia eldii, Gray, *Cat. Ungulata Brit. Mus.* p. 202 (1852), *Cat. Ruminants Brit. Mus.* p. 75 (1872), *Hand-list Ruminants Brit. Mus.* p. 144 (1873); Swinhoe, *Proc. Zool. Soc.* 1869, p. 652; Sterndale, *Mamm. India*, p. 511 (1884).

Cervus eldi, Beevan, *Proc. Zool. Soc.* 1867, p. 759; Sclater, *Trans. Zool. Soc.* vol. vii. p. 348 (1871); Brooke, *Proc. Zool. Soc.* 1878, p. 906; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 180 (1891); Blanford, *Fauna Brit. India—Mamm.* p. 541 (1891); Evans, *Journ. Bombay Nat. Hist. Soc.* vol. ix. p. 326 (1895); Ward, *Records of Big Game*, p. 16 (1896).

Panolia frontalis, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 352 (1873), lxix. part i. p. 592 (1874).

Rucervus eldi, Garrod, *Proc. Zool. Soc.* 1877, p. 17.

Characters.—Height at shoulder about 3 feet 9 inches, hair very coarse, shaggy in winter, and much elongated and thickened about the neck in the males. Antlers rounded and rugose, with a long curved brow-tine, forming a continuation of the curve of the beam, which is set at right angles to the pedicle; the beam unbranched for a considerable distance, curving backwards, then outwards and finally forwards, after which it is dichotomously forked; the outer branch of the terminal fork more complex than the inner one, the number of terminal points varying from two or three to at least eight or ten; one or more prominent snags usually developed at the junction of the brow-tine with the beam; the curve of the two antlers usually more or less unsymmetrical. Colour of winter pelage of males typically dark brown on the upper-parts, and white on the under-parts, sometimes with a white mark above the eye; in winter fawn-coloured above and pale brown beneath; the winter fringe on the neck much darker, and sometimes with a white gorget; does paler rufous fawn, and the very young generally

spotted on the rump with white; a more rufous variety is, however, known which is fully spotted in the adult.

The peculiar curvature of the antlers at once serves to distinguish the thameng, or brow-antlered deer, as it has been called, not only from all other members of the group, but likewise from all species of the genus. On account of this marked peculiarity it has been referred by many writers to a distinct sub-genus, or genus, under the name of *Panolia*, but there can be no hesitation in regarding it as a member of the present group. This view was first taken by the late Mr. Edward Blyth, who has been followed by Professor A. H. Garrod, and most later writers. The skull is of the same general type as in the other two living members of the group, although the premaxillary bones, which form the extremity of the muzzle, are shorter and extend a smaller distance up the face.



FIG. 54.—Frontlet and Antlers of Burmese Thameng. (Rowland Ward, *Records of Big Game*.)

The following dimensions of antlers are taken from Mr. Rowland Ward's *Records of Big Game* :—

Length along Outer Curve.	Circumference.	Tip to Tip.	Widest inside.	Number of Points.	Locality.
42	5	29	24	2-3	Burma
39 $\frac{5}{8}$	5	31 $\frac{3}{8}$	35 $\frac{5}{8}$	20	Siam
38 $\frac{7}{8}$	6 $\frac{1}{4}$	25 $\frac{1}{2}$	30 $\frac{3}{8}$	16-19	?
37 $\frac{1}{2}$	5 $\frac{3}{8}$	20 $\frac{1}{4}$	30 $\frac{1}{2}$	5-5	?
37	6 $\frac{1}{8}$?	31 $\frac{1}{4}$?	Burma
36 $\frac{1}{8}$	5 $\frac{1}{2}$	28 $\frac{3}{4}$	31 $\frac{3}{4}$	4-3	,,
35 $\frac{3}{4}$	4 $\frac{5}{8}$	19 $\frac{3}{4}$	26 $\frac{1}{4}$	4-3	,,
34 $\frac{7}{8}$	5 $\frac{1}{2}$	27 $\frac{1}{2}$	32	6-6	,,
34 $\frac{1}{2}$	4	21 $\frac{1}{4}$	27	6-6	,,
34 $\frac{1}{8}$	5	24	32 $\frac{1}{4}$	6-6	,,
34	5 $\frac{7}{8}$	23 $\frac{1}{2}$	29 $\frac{3}{4}$	10-10	,,

Distribution.—Flat alluvial districts in the countries on the eastern side of the Bay of Bengal, extending from the valley of Manipur in the north,

southwards in suitable localities throughout Burma and the Malay Peninsula, and eastwards to Southern Siam, Cambodia, and the island of Hainan.

Habits.—This very distinct type of deer was discovered by Captain Eld about the year 1840, and papers on its habits were contributed both by that gentleman and by Captain R. C. Beavan ; the following account being taken from the latter officer's paper. "In habits," he writes, "these deer are essentially gregarious, and associate with no other species, although hog-deer abound in the grass and jungle along the edges of the plain ; nor will they allow the tame buffaloes to come nearer to them than about a hundred yards. They are very wary and difficult of approach, especially the males. They are also very timid and easily startled ; the males, however, when wounded and brought to bay with dogs get very savage and charge vigorously. In fact the *thameng* is essentially a plain-loving species ; and although it will frequent tolerably open tree-jungle, for the sake of its shade, it will never venture into dense or matted underwood, that is bush-jungle in contradistinction to tree-jungle.

"When first started the pace of the *thameng* is great. It commences by giving three or four large bounds like the axis or spotted deer, and afterwards settles down into a long trot, which it will keep up for six or seven miles on end when frequently disturbed. This is where the vegetation on the plain is comparatively short. In the rains they do not go far before they find a hiding-place in the paddy [rice]. Their powers of leaping are highly developed. . . . They are least gregarious in the rainy weather. The females have mostly then retired in twos and threes into quiet spots, and the herds are altogether more scattered, owing to the increased density of the vegetation.

"They feed both during the day and night, chiefly in early morning and evening. Their food consists chiefly of jungle paddy ; during the night they do a great deal of damage to the cultivated variety, treading down more than they eat. They also feed on grass, and the leaves of two jungle-trees called in Burmese the *keay* and the *thameh*. In a tamed state they will eat plantain-leaves. The call of the female, uttered when disturbed, is a short barking grunt, that of the males is louder and more prolonged. It is most frequently heard in the rutting-season, during which the males have frequent and severe battles. A pair are known to have been captured whilst so engaged with their antlers interlocked.

“About the end of January the first jungle fire sweeps over the plain and destroys the dry herbage, leaving small patches here and there about the edges of swamps. The second burning takes place about the end of March, and leaves scarcely a blade of grass behind it; the plain is then almost entirely bare, and the deer, having no covert, congregate in large herds. They are then to be seen on all sides, and, the buffaloes having been withdrawn to the tree-jungle, are left alone; they become at this time excessively wary. From the middle of February until the first showers fall at



FIG. 55.—Group of Burmese Thameng. From a photograph by the Duchess of Bedford.

the end of April they apparently subsist without water; they lie in the salt swamps during this period, and get the benefit of heavy dews at night.”

It is added that the pairing-season lasts from the middle of March to the middle of May; and that the hinds bring forth their fawns in October and November among the rice-fields, the rice being then either in flower or in ear, and at its greatest height, so that it affords abundant covert. One fawn is produced at a birth, and often remains with its dam till the second year. Breeding may commence at the end of a year and a half. It is specially stated that while the very young are spotted, all the adults in Burma are of a uniformly brown colour. In Manipur the stags begin to shed their antlers in June, but in Lower Burma they are not lost till about September.

a. BURMESE RACE—CERVUS ELDI TYPICUS

Characters.—Antlers rounded throughout, with few or no additional snags on the terminal tines, and the brow-tine usually very long; colour generally uniform umber-brown, as described above, or with a very few spots along the middle of the back.

Distribution.—The valley of Manipur, and thence southwards through Burma and the Malay Peninsula. It has been shown by Mr. Blyth that antlers from the Malay Peninsula and Mergui are smaller than those from Manipur and Burma, and have also very frequently two or three vertical snags on the brow-tine which are wanting in the latter. This difference is, however, scarcely sufficient to justify a sub-specific separation, especially as there is in all probability a complete gradation between the two types.

b. SIAMESE RACE—CERVUS ELDI PLATYCEROS

Panolia platyceros, Gray, *List Mamm. Brit. Mus.* p. 181 (1843), *Cat. Ungulata Brit. Mus.* p. 203 (1852).

Dama platyceros, Reichenbach, *Naturgesch. Säugethiere*, vol. iii. p. 16 (1845).

Panolia platycercus, Gray, *Cat. Ruminants Brit. Mus.* p. 75 (1872), *Hand-list Ruminants Brit. Mus.* p. 144 (1873).

Plate XV

Characters.—The main termination of the antler much flattened, with a large number of small snags on the sharp hinder edge; and the brow-tine relatively short. Pelage apparently always spotted along the middle line of the back, and sometimes on the sides as well, reddish at all seasons.

In the British Museum this deer is represented by a fine pair of adult antlers from Southern Siam presented by the late Sir R. Schomburgk, which are so different from those of the typical race as to merit sub-specific distinction. In addition to the snags on the summit, they bear a large number of small points near the junction of the comparatively short brow-tine with the beam.

I can find no description of the coloration of Siamese or Cambodian examples. Mr. Swinhoe¹ has, however, described and figured antlers from

¹ *Proc. Zool. Soc.* 1869, pp. 652 *et seq.*



SIAMESE THAMENG IN WINTER PELAGE.

NATIONAL MUSEUM OF NATURAL HISTORY

the island of Hainan which he regarded as intermediate between those of the Burmese and Siamese races, but which were identified by Mr. Blyth in the same paper with the latter. As they show the same flattened extremities, with extra snags, there appears no sufficient justification for separating them from the present race. Mr. Swinhoe describes the Hainan specimens to which some of these antlers belonged as showing two lines of white spots on each side of the back. The British Museum possesses three flat skins from Hainan, sent by Mr. Swinhoe. One of these is an adult in summer pelage, and displays faint traces of spots all over the back and sides. The second belonged to a half-grown animal in the shaggy winter coat, and has little or no trace of spotting. The third is that of a very young fawn, in which faint indications of spots are discernible on the hind-quarters.

The male specimen from Hainan forming the subject of plate xv was presented to the London Zoological Society in 1895 by Mr. Julius Neumann,¹ and was fully spotted when I first saw it, soon after the assumption of the winter dress, as it also was in December, when its colour was foxy red, quite unlike that of the Burmese race. In February 1898 the fringe on the throat had become very long and dark-coloured, with a distinct white gorget. The head-keeper of the Gardens informed me that the summer pelage was also spotted, with the ground-colour of a bright rufous.

It therefore appears that, with present material, the Hainan representative of this deer cannot be separated from the Siamese race. And as the Hainan form frequently shows more or fewer spots on the skin, it is presumed that the same will hold good with specimens from the mainland. The slight degree of spotting on the very young skin in the British Museum is a notable feature. A thameng at Woburn Abbey with a bright red, although unspotted, winter coat, would seem to belong to this race.

Distribution.—Southern Siam, Cambodia, and the island of Hainan.

4. THE SIWALIK SWAMP-DEER—*CERVUS SIVALENSIS* (*Extinct*)

Cervus sivalensis, Lydekker, *Palæontologia Indica* (*Mem. Geol. Surv. Ind.*), ser. 10, vol. i. p. xvii. (1880), *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 104 (1885).

¹ See *Proc. Zool. Soc.* 1895, p. 520; the specimen is there stated to be from South China, but it is labelled Hainan in the Gardens.

Characters.—This species was named on the evidence of molar teeth, which present a considerable resemblance to those of *C. duvauceli*. The skull provisionally assigned to it is likewise very similar to that of the latter, while the antlers probably belonging to the same form are apparently intermediate between those of *C. duvauceli* and *C. eldi*. Even if the skull and antlers belong to a species distinct from that to which the teeth pertained, they serve to indicate the existence in the Siwaliks of a member of the rucervine group.

Distribution.—India during the Pliocene period.

IV. THE MUNTJACS—GENUS CERVULUS

Cervulus, de Blainville, *Bull. Soc. Philom. Paris*, 1816, p. 77 ; Gray, *Cat. Ungulata Brit. Mus.* p. 217 (1852), *Cat. Ruminants Brit. Mus.* p. 93 (1872) ; Brooke, *Proc. Zool. Soc.* 1878, p. 898 ; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 23 (1881).

Styllocerus, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 319 (1827), as a sub-genus.

Prox, Ogilby, *Proc. Zool. Soc.* 1836, p. 135 ; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 361 (1873), lxxix. part i. p. 40 (1879).

Muntjacus, Gray, *List Mamm. Brit. Mus.* p. 173 (1843).

Characters.—Lateral metacarpal bones as in *Cervus*, that is represented only by their upper extremities. Antlers not exceeding half the length of the head, with a short brow-tine and an unbranched beam, supported on long bony pedicles, continued downwards as convergent ridges on the forehead of the skull ; in the female tufts of bristly hair and small projections in the position of the antlers. Typically a small skin-gland on the inner side of each frontal ridge. Muzzle with a large naked portion, extending up between the nostrils, with the upper border of the portion between the same slightly convex ; ears rather small ; tail long, thin, and pointed ; face long. Pelage of adult uniformly coloured above, spotted in young. No metatarsal or tarsal glands and tufts. In the skull the gland-pit very large and deep, and the unossified vacuity of moderate extent ; face-gland large. Median hoofs moderate, lateral hoofs generally small and rudimentary, and the phalangeal bones of their digits entirely wanting.

Upper canines of male forming long recurved tusks, not growing from persistent pulps, those of female smaller; cheek-teeth tall-crowned. Stature small, and rump elevated.

The muntjacs, or rib-faced deer, as they are expressively called, form a small but very natural group. In the presence of a brow-tine to the antlers and the structure of the lateral metacarpal bones they resemble the typical deer; but in the characters of the antlers and their long pedicles, as well as in the retention of tusk-like upper canines, they agree with extinct forms noticed below, so that the divergence between *Cervus* and *Cervulus* must evidently have taken place at a remote epoch. In the uniformly coloured coat of the adult, as well as in the rudimentary condition of the lateral hoofs and the total loss of the lateral phalangeal bones of the feet, they display highly specialised characters. They may be divided into two groups, according to whether the coloration of the adult pelage is of a rufous or yellowish tinge, or of a deep sepia-brown; the members of the second group forming a connecting link between the more typical members of the genus and the tufted deer.

Distribution.—The Oriental and adjacent districts of the Holarctic region.

I. THE INDIAN MUNTJAC—*CERVULUS MUNTJAC*

Cervus muntjac, Zimmermann, *Geogr. Geschichte*, vol. ii. p. 131 (1780).

Cervus vaginalis, Boddaert, *Elenchus Anim.* p. 136 (1785).

Cervulus moschatus, de Blainville, *Bull. Soc. Philom. Paris*, 1816, p. 77; Gray, *Cat. Ungulata Brit. Mus.* p. 218 (1852), *Cat. Ruminants Brit. Mus.* p. 93 (1872).

Cervulus subcornutus, de Blainville, *loc. cit.* (1816).

Cervulus muntjac, de Blainville, *loc. cit.* (1816); Brooke, *Proc. Zool. Soc.* 1874, p. 38, 1878, p. 899; Anderson, *Yunnan Expedition*, p. 337 (1878); Sterndale, *Mamm. India*, p. 500 (1884); W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 173 (1891); Blanford, *Fauna Brit. India—Mamm.* p. 532 (1891); Ward, *Records of Big Game*, p. 1 (1896).

Cervus (Stylocerus) muntjac, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 144, v. p. 319 (1827).

Cervus (Stylocerus) aureus, H. Smith, *op. cit.* vol. iv. p. 148 (1827).

Cervus (Stylocerus) moschatus, H. Smith, *op. cit.* vol. iv. p. 149, v. p. 320 (1827).

Cervus (Stylocerus) subcornutus, H. Smith, *op. cit.* vol. v. p. 320 (1827).

Cervus albipes, F. Cuvier, *Hist. Nat. Mamm.* fasc. lxxv. part vii. (1824-42).

Cervus ratwa, Hodgson, *As. Researches*, vol. xviii. part ii. p. 139 (1833).

Stylocerus muntjak, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 185 (1835).

Stylocerus aureus, Jardine, *op. cit.* p. 185 (1835).

Stylocerus subcornutus, Jardine, *loc. cit.* (1835).

Prox moschatus, Ogilby, *Proc. Zool. Soc.* 1836, p. 135.

Cervus melas, Ogilby, in Royle's *Himalayan Botany*, p. lxxiii. (1839).

Stylocerus ratwak, Hodgson, *Journ. As. Soc. Bengal*, vol. x. p. 914 (1841).

Muntiacus vaginalis, Gray, *List Mamm. Brit. Mus.* p. 173 (1843).

Prox ratwa, Sundevall, K. *Svenska Vet. Ak. Handl.* for 1844, p. 185 (1846) ; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 362 (1873), lxxix. part i. p. 41 (1879).

Prox albipes, Sundevall, *loc. cit.* (1846) ; Fitzinger, *op. cit.* lxxviii. p. 362, lxxix. p. 42 (1879).

Prox stylocerus, Sundevall, *loc. cit.* (1846) ; Fitzinger, *op. cit.* lxxviii. p. 362, lxxix. p. 48 (1879).

Prox muntjac, Sundevall, *loc. cit.* (1846) ; Fitzinger, *op. cit.* lxxviii. p. 362, lxxix. p. 53 (1879).

Prox melas, Sundevall, *loc. cit.* (1846).

Styloceros muntjac, Cantor, *Journ. As. Soc. Bengal*, vol. xv. p. 269 (1846).

Cervulus vaginalis, Gray, *Proc. Zool. Soc.* 1850, p. 234, *Ann. Mag. Nat. Hist.* ser. 2, vol. v. p. 425 (1850), *Cat. Ungulata Brit. Mus.* p. 217 (1852) ; Adams, *Proc. Zool. Soc.* 1858, p. 538.

Cervulus aureus, Jerdon, *Mamm. India*, p. 264 (1867).

Cervulus curvostylis, Gray, *Cat. Ruminants Brit. Mus.* p. 94 (1872), *Hand-list Ruminants Brit. Mus.* p. 165 (1873).

Cervulus tamulicus, Gray, *loc. cit.* (1872).

Characters.—Height at shoulder varying from 20 to 22 inches. Ears

narrow and pointed; tail short (length, inclusive of hair, 7 inches); no tuft on crown of head; lateral hoofs very small; hair comparatively short and fine. General colour deep chestnut-red, darkest on the back, and paler on the under-parts; face and limbs brownish, a black line on the inner side of the pedicles of the antlers continued for some distance down the side of the ridges on the face; tufts of black bristly hair in the female on the spots where the pedicles of the antlers of the male are situated; chin and upper portion of the throat, the hinder part of the abdomen, the inner side of the thighs, and under surface of the tail white; and a small whitish mark on the front of each foot above the hoof. There is normally no black band on the nape of the neck, although a faint indication of such a line has been recorded by Dr. J. Anderson in one Nepalese skin. The maximum recorded length of the antlers is $7\frac{1}{2}$ inches.

Distribution.—Much discussion has arisen as to whether there is more than one species of Indian muntjac, and also as to whether the Malayan forms are identical with the Indian. That all these belong to one species, may, I think, be regarded as certain, although it is quite probable that fuller material might enable one or more of the Malayan races to be separated as distinct sub-species.

On this subject Sir Victor Brooke wrote as follows in 1874 :—"In a large collection of the skins, skulls, and horns of this species, which I have received from all parts of India and Burma, and in a considerable number of living specimens which I have examined, I have observed among adult animals so much difference in size and intensity of coloration that I have found it impossible to retain the muntjac of Java and Sumatra as a distinct species. The muntjacs from the south of India are, as a rule, smaller than those from the north, as is also the case with the axis and Indian antelope. But even this rule is subject to many exceptions. I have received from Northern India perfectly adult, and even slightly aged, specimens of both muntjac and axis inferior in size to the average as presented by these species in Southern India. These small races are always connected with particular areas, and are doubtless the results of conditions sufficiently



FIG. 56. —Frontlet and Antlers of Indian Muntjac. (Rowland Ward, *Records of Big Game*.)

unfavourable to prevent the species reaching the full luxuriance of growth and beauty of which it is capable, though not sufficiently rigorous to prevent its existence."

In 1878 the same writer made the following additional observations :—
 "This species appears to attain a larger size in Java, Sumatra, and Borneo than it does on the mainland; and I think it not improbable that persistent race characters may eventually be found distinguishing the muntjac of these islands from that of British India."

This latter paragraph indicates the probability of the island races being sub-specifically distinct, but says nothing as to the form from Burma and the Malay Peninsula as compared with the one from India.

In 1878, Dr. J. Anderson, who has devoted special attention to the question, wrote as follows :—"Hodgson separated the Nepal form as distinct, having described it as *Styllocerus ratwak*, and Sundevall adopted this opinion, but separated another from the same locality under the name of *Prox styllocerus*. This latter naturalist also considered the Central and Southern Indian barking-deer as a distinct species, and identified it with the *Prox albipes* of Wagner. This latter race Sykes had considered as *C. muntjac*, and more lately Gray renamed it under the designation of *C. tamulicus*. I have examined the types of *Stylloceros ratwa* and *C. tamulicus*, but I cannot detect that they differ specifically from *Cervulus muntjac* of other parts of India, and the specific name applied by Sundevall to the Malabar race seems to indicate that it is also the same. They appear to me to be only local races of one widely distributed species which ranges over the Himalaya, India, and Ceylon through Arracan and Burma to the Malayan Peninsula, Sumatra, and Java, spreading from the Himalaya eastwards to the seaboard of China, and, according to Swinhoe, stretching to the island of Hainan, where, he says, *C. reevesi* is replaced by the allied Indian form." To this distributional area Borneo has to be added. Examples from the latter island, Sumatra, and Java, are, as already said, of somewhat larger dimensions than those from the Indian mainland, and should for this reason probably be regarded as sub-specifically distinct, but further material is required before the splitting up can be attempted.

Habits.—The names of this species, both scientific and popular, are remarkably numerous. In Hindustani it is known by the title of kakar, while among English names we have, in addition to muntjac and rib-faced

deer, the appellations of barking-deer, jungle-sheep, and red hog-deer ; the latter being apparently confined to Ceylon, while jungle-sheep, which is also applied to the four-horned antelope, is employed in Southern India.

The muntjac, like so many of the smaller deer, is a non-gregarious species, generally found solitary, although associating at certain seasons of the year in pairs. Very rarely have four, or even three, been seen in company. Its movements in covert are cautious and stealthy, the animal carrying its head low, and creeping among tangled thickets or under fallen timber, with the hind-quarters elevated. In running, the same postures are adopted, but when walking quickly the legs are slowly lifted in a peculiarly deliberate manner. These deer are seldom seen outside thick covert, which they only leave to feed on the grass in the immediate outskirts or in artificial clearings. A peculiarity, probably shared by the other members of the genus, is the great length of the tongue, which can be protruded to such an extent that the whole face is capable of being licked. In spite of their very small size the antlers of the bucks appear to be shed annually, falling in May, and being replaced by August. Although in some districts at least the fawns appear to be produced at any time, the regular pairing-time in Northern India is mainly during January and February, six months after which the young make their appearance in the world ; either one or two being produced at a birth.

The hoarse, barking cry from which the species derives one of its popular names is loud, and uttered both during the pairing-season, and under the influence of alarm. Morning and evening are the usual times when this call is heard echoing through the stillness of the jungle, but it is sometimes uttered after dark, and in the cold season in Burma Mr. Blanford has heard it in the afternoon. In fighting, the bucks make use of their long upper canine teeth as their principal, if not sole, weapons of attack and defence. In captivity Mr. Sterndale states that muntjacs are coarse feeders, eagerly devouring any kind of meat that may be offered them. Nevertheless, their flesh is of excellent quality, far superior to that of most Indian deer.

At Woburn Abbey muntjacs are allowed to run wild in some of the coverts, where they thrive well, although of course they are but seldom seen except during a beat.

2. THE TIBETAN MUNTJAC—*CERVULUS LACHRYMANS*

Cervulus lacrymans, Milne-Edwards, *Arch. Mus. Paris*, vol. vii. p. 93 (1871), and *Recherches Mamm.* p. 348 (1872-74); Brooke, *Proc. Zool. Soc.* 1874, p. 40, 1878, p. 899; Anderson, *Yunnan Expedition*, p. 338 (1878).

Cervulus sclateri, Swinhoe, *Proc. Zool. Soc.* 1872, p. 814; Brooke, *ibid.* 1874, p. 40; Gray, *Hand-list Ruminants Brit. Mus.* p. 165 (1873); W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 173 (1891).

Characters.—Nearly allied to the last, but slightly smaller, the height at the shoulder being about 19 inches. General colour of pelage bright rufous brown, with the hairs on the back speckled, the neck and head bright yellowish brown; the face-markings and under-parts as in the preceding species.

Sir Victor Brooke's description of this species is as follows:—

“The entire forehead, occiput and outer side of ear-conchs yellow. The intensity of the yellow varies in different specimens, but is always sufficiently strong to form a very conspicuous character in the appearance of the males of this species. A line running up the inside of the horn-pedestals, starting from the frontal glands, jet-black, this marking contrasting strongly with the yellow of the forehead; cheeks, anterior parts of neck and throat, belly, and upper surface of tail foxy red. Chin, a line running down the anterior surface of the tibial portion of the hind-limbs and under surface of tail white. The rest of the body bluish brown speckled with red.”

In addition to its inferior size, the chief external characteristic distinguishing this species from the last appears to be the brighter and more yellow tint of the head and neck. The skulls of the two forms are distinguished sufficiently by their size, that of *C. muntjac* measuring $8\frac{1}{4}$ inches in length, and that of the present species only about 7 inches. The type specimen is in the Paris Museum.

Distribution.—Moupin, in Eastern Tibet, and the hills near Hangchau, China; probably also in some of the intermediate districts.

3. THE CHINESE MUNTJAC—*CERVULUS REEVESI*

Cervus reevesii, Ogilby, *Proc. Zool. Soc.* 1838, p. 105.

Prox. reevesii, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 185

NATIONAL ACADEMY OF SCIENCES
WASHINGTON, D. C.



TENASSERIM (1) AND HAIRY-FRONTED (2) MUNTJACS.

(1846) ; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 362 (1873), lxxix. part i. p. 60 (1879).

Cervulus reevesii, Gray, *Knowsley Menagerie*, p. 65 (1850), *Cat. Ungulata Brit. Mus.* p. 220 (1852), *Cat. Ruminants Brit. Mus.* p. 94 (1872) ; Brooke, *Proc. Zool. Soc.* 1878, p. 899 ; Anderson, *Yunnan Expedition*, p. 338 (1878).

Cervulus reevesi, Swinhoe, *Proc. Zool. Soc.* 1862, p. 361 ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 174 (1891).

Cervulus micrurus, Sclater, *Proc. Zool. Soc.* 1875, p. 421, 1876, p. 696.

Characters.—The smallest member of the group, the size being about one-third less than that of the Indian species. Face shorter and broader, the pedicles of the antlers less divergent, and the face-glands considerably larger than in the two preceding species. General colour of pelage reddish chestnut speckled with yellowish gray, a distinct black band running down the nape of the neck, limbs blackish brown, under-parts and face-markings much as in the two preceding species. Length of skull $5\frac{3}{4}$ inches ; its gland-pit very large.

The distinctive points in this species are the small size, the large face-gland, and the black nape-streak. Dr. Anderson gives minute details as to differences between the skull and that of *C. reevesi*.

Distribution.—Southern China, as far north as Ningpo, and Formosa.

Habits.—In Formosa Mr. Swinhoe states that this muntjac affects the lower ranges of hills, which are covered with long coarse grass and tangled thicket. "It is there usually found in small herds, basking in the sun, or lying in hidden lairs. They are very seldom approached near, except by stealth. The least noise startles them, and they dash away with bounds through the yielding grass, occasionally showing their rounded backs above the herbage. They have, however, their regular creeps and passes through the covert, near which the natives lie when stalking them, while others drive them. The little startled creatures hurry from danger along those beaten tracks, and are thus picked off with the matchlock."

4. THE TENASSERIM MUNTJAC—*CERVULUS FEÆ*

Cervulus feæ, Thomas and Doria, *Ann. Mus. Genova*, ser. 2, vol. vii. p. 92 (1889) ; Blanford, *Fauna Brit. India—Mamm.* p. 534 (1891) ; Thomas, *Ann. Mus. Genova*, vol. x. p. 945, plate x (1892).

Plate XVI, fig. 1

Characters.—Allied to the next species, with which it agrees in its sepia-brown, instead of reddish or yellowish chestnut, general coloration, and its black and white, instead of chestnut and white, tail. Distinguished from *C. crinifrons* by the absence of the tuft of hair on the forehead, and the consequent clearly defined face-markings, the presence of a white line on the lower part of the hind-leg, and the much shorter tail. Size about equal to that of the Indian muntjac.

The following is the original description. General colour of body uniform dark brown, the centre of the crown, the pedicles of the antlers, occiput, and the region round the bases of the ears bright yellow; a black line running up the inner side of each pedicle; neck uniform brown; fore-legs brown superiorly, darkening to black on the metacarpals, with the terminal inch next the hoof white all round, and a line of scattered white hairs running up the front to the carpal joint (knee); hind-legs similarly coloured, but with a distinct white line on the front. Tail short, black above, white below and at the sides, the two colours sharply contrasted. Under-parts brown, mixed with whitish on the chin and inner surfaces of the limbs. Face-glands large and prominent, but those on forehead wanting. This species, which is known only by a single specimen preserved in the museum at Genoa, forms a connecting link between the three preceding forms and *C. crinifrons*.

Distribution.—Mountains south-east of Maleyit, Tenasserim, and probably other parts of the country.

5. THE HAIRY-FRONTED MUNTJAC—*CERVULUS CRINIFRONS*

Cervulus crinifrons, Sclater, *Proc. Zool. Soc.* 1885, p. 1, plate i.; Styan, *ibid.* 1886, p. 267.

Plate XVI, fig. 2

Characters.—The largest species, the height at the shoulder being about $24\frac{1}{2}$ inches. Forehead and crown of head tufted, so as to conceal the pedicles of the antlers; hair longer and coarser, ears shorter, more rounded and more thickly haired externally, the tail much longer, and the lateral hoofs larger than in either of the chestnut-coloured species. General colour of pelage dark sepia-brown, with a tinge of purple, and the back finely speckled with rufous; head-tuft, ears, forehead, and cheeks bright orange

Hairy-Fronted Muntjac

211

chestnut ; a V-shaped faint dark mark near the pedicles ; limbs and under-parts dark blackish brown, except the abdomen, which is whitish ; inner side of hind-legs rufous chestnut ; inner surface of thighs, and sides and lower surface of tail pure white ; upper surface of tail and a line extending on to the rump black. Length of tail about 9 inches. Frontal glands probably absent.

The above description is taken from a male specimen forming the type, which was purchased by the Zoological Society in 1884 from Mr. Michie, and is now mounted in the British Museum. From the small size of the antlers and tusks, it is not improbably immature, so that the height may really be greater than stated above.

The skin of a female was procured in 1886 by Mr. F. W. Styan, who gives the following description of its colour : — “ Upper-parts rich dark glossy brown, mixed with black, darkest along the middle of the back. Belly and inner sides of thighs pure white, the line of demarcation very distinct, except in the lower part of the thighs, where it merges gradually into dark brown. Tail above black, below pure white ; a pale patch under the forearm ; rest of the under-parts dark brown. The



FIG. 57.—Head of Hairy-fronted Muntjac.
(Rowland Ward, *Records of Big Game*.)
The tusks are not shown.

brown of the neck gradually passes into reddish brown on the sides of the head ; the nose-ridge dark brown ; the longitudinal slits form a black V, the colour between them is a bright reddish brown, which turns into a fiery orange-brown in the tuft of bristly hair, rather more than two inches long, which rises from the top of the forehead. On each side of this is a very small bony pedicle surmounted by short tufts of hair of the same colour. Ears at the base of the same hue, but not quite so bright, and fading into brown on the upper part.”

In the tuft on the forehead, the small rounded ears, the coarse hair, general coloration, and perhaps also the small size of the antlers, this species serves to connect the more typical muntjacs with the tufted deer.

Distribution.—Eastern China, in the neighbourhood of Ningpo.

Nothing is known as to the habits of this species, but Mr. Styan states that it is apparently very rare, his collector refusing to believe in its existence until he came across the female specimen described above. The only other known example is the type male.

V. THE TUFTED DEER—GENUS ELAPHODUS

Elaphodus, Milne-Edwards, *Arch. Mus. Paris*, vol. vii. p. 93 (1871), *Recherch. Mamm.* p. 353, plates lxxv-lxxvii (1872-74); Garrod, *Proc. Zool. Soc.* 1876, p. 757; Brooke, *ibid.* 1878, p. 899; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 28 (1881).

Lophotragus, Swinhoe, *Proc. Zool. Soc.* 1874, p. 452.

Characters.—Lateral metacarpals as in *Cervus*, but still more rudimentary, and occasionally wanting. Antlers very small, supported on long slender pedicles, which diverge on the face, and do not send down long ridges on the forehead of the skull; scarcely projecting above the large frontal tufts of hair. No glands on the forehead. Other characters generally as in *Cervulus*, but the long tusks of the male not everted at the tips, the hair always very shaggy and coarse, the ears broad, rounded, and thickly haired externally, and the tail of moderate length. The young are spotted only along the middle line of the back.

The genus is very closely connected with the preceding by means of the hairy-fronted muntjac, and it may even be a question whether the two should not be merged in one; in which case the two members of the present group should be regarded as sub-species rather than species. Both *Cervulus* and *Elaphodus* present a remarkable peculiarity in the structure of the ankle-joint, or tarsus, found in no other Old-World deer. In common with other ruminants, all the *Cervidæ* have the navicular and cuboid bones¹ of the tarsus welded together into a compound bone known as the naviculo-cuboid; but in the two genera mentioned a further solidification of this joint is brought about by two other bones, respectively termed the middle and outer cuneiform bone, uniting with the naviculo-cuboid. Further evidence of their affinity is afforded by the structure of the skull, the large

¹ For explanation of these terms, see Flower, *Osteology of the Mammalia*.

tusks, and the absence of the metatarsal tufts. It was once thought that the presence of frontal cutaneous glands formed a point of distinction, but these are now known to be wanting in *Cervulus feæ*, as they probably are in *C. crinifrons*.

Distribution.—The south-eastern portion of the Eastern Holarctic region.

I. THE TIBETAN TUFTED DEER—*ELAPHODUS CEPHALOPHUS*

Elaphodus cephalophus, Milne-Edwards, *Arch. Mus. Paris*, vol. vii. p. 93 (1871), *Recherch. Mamm.* p. 353 (1872-74); Garrod, *Proc. Zool. Soc.* 1876 p. 757, in part; Brooke, *ibid.* 1878, p. 899.

Characters.—General proportions much the same as in the Indian muntjac, the height at the shoulder being from about 22 to 23 inches. Hair very coarse and pithy. General colour of pelage deep chocolate-brown; the hairs in front of a vertical line drawn through the shoulder-joint being whitish at the base, and gradually becoming dark brown towards the tip, quite close to which is a narrow white ring, thus producing a speckled appearance in this region; posteriorly to the line mentioned the white on the hairs absent, each hair gradually darkening from the white base to become rich brown at the tip over the sides and back, the colour being deeper on the middle line of the latter, and also darkening on the legs, which near the hoofs become almost or completely black; in some cases a white line on the front of the legs above the hoofs. Hair of frontal crest forming a horse-shoe on the forehead of a nearly black colour, bordered by a gray line above the eye; ears whitish internally, the tip and the greater part of the inner edge nearly pure white, and a transverse black band about three-quarters of an inch in depth extending across the lower part of the inner surface; under surface of tail and inside of thighs and buttocks white.

This species, which is the type of the genus, is only known to me by the descriptions of Messrs. Milne-Edwards and Garrod, the type specimens being in the Paris Museum, and the British Museum possessing no examples. It was one of the animals first discovered by Père David, in his journeys through Tibet.

Distribution.—Eastern Tibet, in the neighbourhood of Moupin. Nothing appears to be ascertained as to the habits of this species.

2. MICHIE'S TUFTED DEER—*ELAPHODUS MICHIANUS*

Lophotragus michianus, Swinhoe, *Proc. Zool. Soc.* 1874, p. 452; Garrod, *ibid.* 1876, p. 757, plate lxxvi.

Elaphodus michianus, Brooke, *Proc. Zool. Soc.* 1878, p. 900; Styan, *ibid.* 1886, p. 268.

Plate XVII, fig. 1

Characters—Very closely allied to the last, from which it is chiefly or entirely distinguished by small differences of coloration. General hue



FIG. 58.—Head of Immature Male of Michie's Tufted Deer. From Garrod, *Proc. Zool. Soc.* 1876.

more decidedly iron-gray, or pepper-and-salt colour, the individual hairs being whitish with brown tips, and only a few of those occupying a very small area in front of the ear being ringed with white; lips, eye-brows, and cheeks paler; forehead and crest of male brown, of female lighter; under-parts slightly lighter, and a little white showing on the front of the thigh. Young very similarly coloured, but no pale eyebrow, and a row of not very distinctly marked white spots on each side of the back, followed by very faint traces of a second outer row.

The history of this species is somewhat remarkable. It was originally described under the name of *Lophotragus* by the late Mr. Swinhoe, who



MICHIE'S TUFTED DEER (1) AND CHINESE WATER-DEER (2).

NATIONAL BUREAU OF STANDARDS

appears to have been unacquainted with Professor Milne-Edwards' description of *Elaphodus* published a few years previously. In 1876 the late Professor A. H. Garrod demonstrated the unity of these two genera, and also came to the conclusion that the Tibetan and Chinese animals were not specifically distinguishable. This latter view was disputed by Sir Victor Brooke, who was subsequently supported by Mr. O. Thomas. As already said, the two forms are so similar that it is quite likely they should be regarded as sub-species rather than species, but so long as they are placed in a genus apart by themselves, this is a matter of little importance.

Distribution.—Eastern China, in the neighbourhood of Ningpo, and probably in other districts.

Habits.—Beyond the statement that it is fond of the neighbourhood of water and is found abundantly in the reed brakes bordering the rivers of Eastern China, there seems nothing recorded of the habits of this little deer. Ten specimens have been exhibited alive in the gardens of the London Zoological Society between the years 1876 and 1884, and there was one some time ago at Woburn Abbey. The British Museum possesses mounted skins of the male, female, and young.

VI. THE MIOCENE MUNTJACS—GENUS DREMOTHERIUM (*Extinct*)

Dremotherium, Geoffroy, *Rev. Encyclop.* vol. lix. p. 82 (1833); Filhol, *Ann. Sci. Géol.* vol. xi. art. 1, p. 40 (1881).

Palæomeryx, Meyer, *Foss. Knochen und Zähne Georgesmünd*, p. 92 (1834); Rüttimeyer, *Abh. schweiz. pal. Ges.* vol. x. p. 79 (1883); Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 119 (1885); Schlosser, *Morphol. Jahrb.* 1886, pp. 68 and 294.

Micromeryx, Lartet, *Notice sur la Colline de Sansan*, p. 36 (1851).

Amphitragulus, Pomel, *Cat. Méthodique*, p. 100 (1853).

Propalæomeryx, Lydekker, *Palæontologia Indica*, ser. 10, vol. ii. p. 173 (1883).

Characters.—Lateral metacarpals in certain cases complete, but in some of the later forms apparently entirely absent; antlers wanting in the earlier species, but present in some of the later ones; when present, mounted on long pedicles, from which they are imperfectly differentiated by a burr; simply

forked, covered with skin, and non-deciduous. Molars short-crowned, those of the lower jaw with a characteristic fold in the enamel ; tusk-like canines developed at least in those species in which antlers are wanting.

Following Dr. Max Schlosser, I regard *Amphitragulus*, in which there are four lower pre-molars, as not generically separable from *Dremotherium* proper, in which there are only three of these teeth. The earlier forms of the genus (from the Oligocene beds of St. Gérard-le-Puy, France) are all without antlers, and as many of them appear to retain both ends of the lateral metacarpals, they may doubtless be regarded as the ancestral types of the modern Old World deer, and probably also of those of North America. It will be unnecessary to refer to these Oligocene species by name, and specific mention is made only of two of those in which antlers are present. These are of such a type as might be expected to occur in the common ancestor of the brow-tined and fork-antlered deer of the present day.

In North America the Miocene muntjacs were represented by the closely allied genera *Blastomeryx* and *Cosoryx*. Writing of these, Messrs. Scott and Osborn¹ observe that “*Blastomeryx* is, so far as we can at present determine, almost identical with the type variously named in Europe *Palæomeryx* and *Dremotherium*, about the only difference of importance being the absence of the characteristic *Palæomeryx*-fold on the lower molars. *Cosoryx* is very closely allied to *Blastomeryx*, and is distinguished from it by the much more hypsodont (tall-crowned) molars.” *Cosoryx* is admitted to be the ancestor of the American prong-buck (*Antilocapra*), and has also been regarded as having given rise to the American deer, but doubts as to the correctness of the latter theory are suggested in the sequel. With regard to the antlers of these forms, Messrs. Scott and Osborn state that they were almost certainly covered with skin, their smooth surface showing that they could not have been bare. They likewise state that their own observations show “nothing which can be opposed to the view expressed by Professor Cope that *Blastomeryx* should be placed in the ancestral line of the distinctly American deer. *Alces*, *Rangifer*, and *Cervus* are really immigrants from the Old World, and do not belong to this category ; but the truly American types, of which *Cariacus* (= *Mazama*) is the chief example, have a peculiar skull-structure, first pointed out by Garrod, which seems to show that the American deer were separated from

¹ *Bull. Mus. Harvard*, vol. xx. p. 82 (1890).

those of the Old World at a comparatively early date, although it is very questionable whether both series could have independently acquired the extraordinary peculiarity of the deciduous antler."

When treating of *Cosoryx*, they observe that "both *Blastomeryx* and *Cosoryx* are probably to be derived from the species referred to the former genus which occur in the John Day beds, but there is no form yet known in the White River which could have given rise to the John Day ruminants. The latter are most probably descended from some *Palæomeryx* (= *Dremotherium*) of the Old World which migrated to this continent." We have thus, even on this view, an original Old World origin for all the American deer.

1. HENSEL'S MUNTJAC—DREMOTHERIUM FURCATUM (*Extinct*)

Palæomeryx scheuchzeri, Meyer, *Neues Jahrb. Min.* 1838, p. 413, in part.

Prox furcatus, Hensel, *Zeitschr. deutsch. geol. Ges.* vol. xi. p. 278 (1859).

Palæomeryx furcatus, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 120 (1885); Schlosser, *Morphol. Jahrb.* vol. xii. p. 68 (1886).

Characters.—This is a large species from the Miocene beds of Bavaria and France characterised by possessing antlers divided into a long fork immediately above the incipient burr. Apparently the lateral metacarpals are wanting. Dr. Schlosser remarks that this species is the earliest antlered deer, the simply forked antlers being never shed and covered during life with skin. Owing to the apparent absence of the lateral metacarpals, the species cannot be the ancestor of any of the existing deer.

2. KAUP'S MUNTJAC—DREMOTHERIUM ANOCEROS (*Extinct*)

Cervus anocerus, Kaup, *Archiv. Mineral.* vol. vi. p. 217 (1833).

Cervus dicranoceros, Kaup, *op. cit.* p. 219 (1833).

Cervus trigonoceros, Kaup, *op. cit.* p. 221 (1833).

Dicrocerus anocerus, Gaudry, *Les Enchaînements, etc.* p. 84 (1878).

Cervulus (?) *dicranoceros*, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 117 (1885).

Characters.—This species, of which the remains occur typically in the Pliocene strata of Eppelsheim, Hessen Darmstadt, appears closely allied to

the last, but the beam of the antler does not divide till after a considerable distance from the incipient burr, and the fork is short. The limbs are unknown.



FIG. 59.—Frontlet and Antlers of Hensel's Muntjac. After Rütimeyer.

VII. THE TUSKLESS MUNTJACS—GENUS *DICROCEROS* (*Extinct*)

Dicrocerus, Lartet, *Notice sur la Colline de Sansan*, p. 34 (1851); Schlosser, *Morphol. Jahrb.* vol. xii. p. 68 (1886).

Characters.—According to Dr. Schlosser, the one known species of this genus differs from *Dremotherium* by the slight development of the fold in the enamel of the lower molars, and by the antlers exhibiting a stronger development, with the commencement of a distinct burr; thus, at any rate,

foreshadowing a periodical replacement. According to Filhol, the upper canines, if present at all, are small.

Distribution.—Europe in the Miocene epoch.

THE SANSAN MUNTJAC—DICROCEROS ELEGANS (*Extinct*)

Dicrocerus elegans, Lartet, *Notice sur la Colline de Sansan*, p. 34 (1851), in part ; Gaudry, *Les Enchaînements*, etc. p. 84 (1878) ; Schlosser, *Morphol. Jahrb.* vol. xii. p. 68 (1886).

Cervus dicroceros, Gervais, *Zool. et Pal. Françaises*, 1st ed. p. 86 (1848-52) ; Filhol, *Mamm. Foss. de Sansan*, p. 268 (1891).

Characters.—The remains of this species, which have often been confounded with *Dremotherium furcatum*, occur in the Miocene strata of Sansan, in the Department of Gers, France, and probably in the contemporaneous deposits of other parts of the Continent. The antlers have the same general form as those of *D. furcatum*, but the cheek-teeth resemble those of *Cervus*, and in M. Filhol's figure no upper tusks are shown.

VIII. THE WATER-DEER—GENUS HYDRELAPHUS¹

Hydropotes, Swinhoe, *Proc. Zool. Soc.* 1870, p. 90 ; Gray, *Cat. Ruminants Brit. Mus.* p. 95 (1872) ; Brooke, *Proc. Zool. Soc.* 1872, p. 522, 1878, p. 916 ; Garrod, *ibid.* 1877, p. 789 ; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 21 (1881) ; Forbes, *Proc. Zool. Soc.* 1882, p. 636 ; nec *Hydropota*, Rond, 1861.

Characters.—Lateral metacarpal bones as in *Rangifer*, that is to say, represented only by their lower extremities. Antlers wanting. Muzzle with a large naked portion surrounding the nostrils ; ears moderate, narrow, and pointed ; tail very short ; face rather long. Pelage uniformly coloured in the adult, spotted in the young. No metatarsal or tarsal glands and tufts. In the skull, the gland-pit small but deep ; face-gland small. Lateral hoofs of moderate size. Upper canines of male forming very long, curved, and slightly convergent tusks, which grow from semi-persistent pulps, those of the female smaller ; cheek-teeth tall-crowned. Size small. In very old animals the pulp-cavity of the upper canines obliterates.

¹ New name.

As additional characters of the skull, it may be noticed that the auditory bullæ on its lower surface are greatly inflated, and that the hinder angle of the lower jaw is much produced backwards, forming a compressed semi-circular process projecting behind the level of the condyle by which the jaw is articulated with the skull. The vomer does not divide the aperture of the posterior nostrils. The hind-feet have deep glands between the hoofs, but in the front pair the corresponding glands are small and shallow.

In his *Catalogue of Ruminants* the late Dr. Gray classed the Chinese water-deer with the musk-deer in a separate family. The resemblance between the two is, however, entirely superficial; Professor Garrod and others having shown that their internal anatomy is quite distinct. From the structure of the ankle-joint and the lateral metacarpal bones, as well as from the inflated auditory bullæ of the skull, there is probably no very close affinity with the muntjacs and their allies. Sir Victor Brooke, who at first thought the water-deer might be related to the rusine deer, subsequently came to the conclusion that its affinities were rather with the roes, which it resembles in the structure of the lateral metacarpals and the form of the lower jaw. On this subject the late Mr. W. A. Forbes, after a study of certain parts of its internal anatomy, wrote as follows:—"Sir Victor Brooke has been led, from a consideration of other points, to associate *Hydropotes* and *Capreolus* with *Alces*, as a group *per se*, with affinities in some points in the direction of the Old World, in others in that of the New World forms. It appears to me that the additional evidence in this paper, especially that derived from the resemblance of the generative organs, is strongly in favour of this association, so far, at least, as *Hydropotes* and *Capreolus* are concerned. The general similarity in appearance of *Capreolus* to *Hydropotes* has often struck me, and has even, I believe, led others into the error of mistaking one for the other! That *Hydropotes* is in no way intimately related to *Moschus* has been already amply demonstrated." I can fully endorse the external resemblance between the water-deer and the roes, when seen at a distance in a park; although the difference in their movements affords a mode of discrimination. Probably *Hydrelaphus* is an ancient type, although no fossils have been referred to it. The lower jaw of a deer from the Miocene of Sansan in France has, however, been described under the name of *Strongylognathus*,¹ which has the same peculiar

¹ Filhol, *Mamm. Foss. de Sansan*, p. 265, plate xxx (1891); originally named *Platyprosopus*.

hinder angle, and may indicate an allied form, but as a similar peculiarity occurs in the roes it cannot certainly be assigned to the present genus.

Distribution.—The eastern extremity of the Eastern Holarctic region.

THE CHINESE WATER-DEER—HYDRELAPHUS INERMIS

Hydropotes inermis, Swinhoe, *Proc. Zool. Soc.* 1870, p. 89; Hamilton, *ibid.* 1871, p. 258, 1873, p. 473; Brooke, *ibid.* 1872, p. 522, 1878, p. 916; Gray, *Cat. Ruminants Brit. Mus.* p. 95 (1872); Garrod, *Proc. Zool. Soc.* 1877, p. 789; Forbes, *ibid.* 1882, p. 636.

(?) *Hydropotes argyropus*, Heude, *C. R. Ac. Paris*, vol. xcvi. p. 1017 (1884), imperfect description.

Plate XVII, fig. 2

Characters.—Height at shoulder about 20 inches. Hair very coarse and thick, longest on the neck and rump; the individual hairs on the back and sides flattened, and undulated from side to side. General colour of upper-parts light rufous chestnut, stippled with blackish, the rufous tinge most marked on the head and back of the ears; the individual hairs grayish white from the base for the greater part of their length, then blackish brown, and finally light chestnut, the dark rings giving the stippled appearance to the pelage; neck paler than back, with its under surface plain-coloured; shoulder, limbs, and tail brownish chestnut; under-parts, front of thigh, chin, throat, a narrow band on the muzzle, a mark above the eye, and the inner surface of the ear white or whitish. The fawn is somewhat sparsely and indistinctly spotted with white; the spots running in longitudinal lines from the neck to the tail, leaving a space of about an inch and a half in width uniformly coloured. The upper line of spots is fairly distinct and defined, but the two lower ones are shorter and more irregular. The indistinctness of the spots is due to the circumstance that they are formed, not by completely white hairs, but by hairs which are reddish for the greater part of their length and only tipped with white.

Distribution.—North-Eastern China, typically from the islands in the Yang-tsi-kiang, and perhaps Corea. The form stated to come from the latter locality was considered to be a distinct species and named *H. argyropus*, but no sufficient description of it seems to have been published, although it is stated to be lighter coloured than the ordinary form.

Habits.—Between the years 1873 and 1883, inclusive, the Chinese water-deer was represented by seven examples in the London Zoological Gardens, although none have been received between the latter date and 1896. A female is now (1898) living in the park at Woburn Abbey. A female in the possession of M. Cornély bred at Tours in 1877, the number of fawns produced being three; and it appears that either three or four is the usual number of young at a birth, the female having four nipples. This prolific reproduction is quite unique among the *Cervidæ*, and is one of the reasons for regarding the genus as a very ancient type.

The Chinese name of the animal at Shanghai is *ke*. In his original description Mr. Swinhoe writes that these small deer “crouch in the reeds and long grass, admitting pretty close approach, and then, rising with a bound, spring away. They were generally put up singly or in twos and threes. In running, they cock their ears, round their fore-legs, bend up their hind-legs, hog their rumps, and scurry away with little quick leaps, very much after the manner of a hare.” These observations are fully confirmed by the habits of the female at Woburn Abbey. This animal is kept in a large paddock, where the grass is rather long and tussocky. Among these tussocks it lies so completely concealed, that hours may be spent without catching a glimpse of it. When disturbed, it springs off with the short quick leaps mentioned by Swinhoe. After running for some distance it drops among the grass with a suddenness which is almost startling. The grass in its paddock being of only a moderate height, the head and neck of the little deer are fully visible, and its restless eyes may be seen watching the intruders. Presently the head and neck are lowered, and the creature becomes completely hidden. Among its native reeds it would doubtless become quite invisible from the moment of dropping.

IX. THE ROES—GENUS CAPREOLUS

Capreolus, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 313 (1827); Gray, *Cat. Ungulata Brit. Mus.* p. 221 (1852), *Cat. Ruminants Brit. Mus.* p. 80 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 352 (1873), lxx. part i. p. 239 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 917; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 41 (1881).

Characters.—Lateral metacarpal bones as in *Rangifer*. Antlers comparatively small, rising very close together and almost vertically from the crown of the head, without a brow-tine, the beam dichotomously forking at a point usually about two-thirds of the total length, and the posterior, or upper prong of this fork, which is the larger, again dividing; the normal number of tines being thus three. Muzzle with a large naked portion extending up between the nostrils, the upper border of the portion between the same straight, and the part below the nostrils narrow; ears large; tail very short and rudimentary; face short, with the muzzle blunt. Pelage of adult uniformly coloured, with a pure white patch in the region of the tail in winter; young spotted. A metatarsal gland and tuft, situated in the upper half of the metatarsal segment. In the skull, the gland-pit extremely small and shallow, the face-gland itself being almost obsolete. Lateral hoofs well developed. Upper canines wanting; upper molars tall-crowned, without distinct additional columns on the inner side. On the under surface of the skull the vomer not dividing the inner aperture of the nostrils into two portions. Size rather small; build tall.

The lower jaw has the same contour posteriorly as in the Chinese water-deer; but the auditory bullæ on the under surface of the skull are not markedly inflated, and the unossified vacuity near the gland-pit is reduced to a narrow slit. The foot-glands are very similar to those of *Hydrelaphus*, being rudimentary in the fore-feet, and deep in the hinder pair. With regard to the systematic position of the genus, the late Professor Garrod¹ wrote that "*Capreolus caprea* is one of the most difficult of the deer tribe to localise; and I have placed it not far from *Cervulus* on account of the configuration of" certain organs. In some degree this reference is confirmed by the extinct *Dremotherium*, in which the antlers are to a certain extent intermediate between the brow-tined and the forked types. But if *Capreolus* is close to *Hydrelaphus* and the latter is remote from *Cervulus*, the connection between the first and third cannot be very intimate. In the structure of the lateral metacarpal bones *Capreolus* resembles *Mazama*; and by Sir Victor Brooke *Alces*, *Hydrelaphus*, and *Capreolus* were placed in a group by themselves next the American deer. The late Dr. Gray was so fully convinced of the intimate relation between the present genus and the American deer, that he termed some of the latter "American roes"; and probably this

¹ *Proc. Zool. Soc.* 1877, p. 18.

latter relationship is the closest. The under-mentioned fossil species shows that the genus is an ancient type. The existing roes are so similar to one another that they might well be regarded as sub-species instead of species, but in a restricted genus the matter is of no importance, one way or the other.

Distribution.—The Eastern Holarctic region, dating from the early part of the Pliocene period.

1. THE EUROPEAN ROE—CAPREOLUS VULGARIS

Cervus capreolus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 94 (1766) ; Jenyns, *Brit. Vert. Animals*, p. 35 (1835) ; Bell, *British Quadrupeds*, p. 407 (1837) ; Owen, *Brit. Foss. Mamm.* p. 487 (1846).

Cervus capreolus fossilis, Cuvier, *Ossements Fossiles*, ed. 3, vol. iv. p. 103 (1825) ; Meyer, *Palæologica*, p. 95 (1832).

Cervus (Capreolus) capreolus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 124, v. p. 314 (1827) ; Blasius, *Säugethiere Deutschl.* p. 457 (1857).

Capreolus vulgaris, Fitzinger, *Beitr. Landesk. Österreichs*, vol. i. p. 317 (1832), *SB. Ak. Wien*, vol. lxxviii. part i. p. 353 (1873), lxx. part i. p. 239 (1874).

Capreolus europæus, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841) ; Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 184 (1846).

Capreolus capræa, Gray, *List Mamm. Brit. Mus.* p. 917 (1843), *Cat. Ungulata Brit. Mus.* p. 222 (1852), *Cat. Ruminants Brit. Mus.* p. 81 (1872) ; Brooke, *Proc. Zool. Soc.* 1878, p. 917.

Capreolus fossilis, Owen, *Rep. Brit. Assoc.* for 1843, p. 238 (1844), *Brit. Foss. Mamm.* p. 487 (1846).

Capreolus caprea, Bell and Alston, *British Quadrupeds*, p. 362 (1874) ; Flower and Garson, *Cat. Ost. Mus. Coll. Surg.* part ii. p. 318 (1884) ; Ward, *Records of Big Game*, p. 53 (1896) ; Satunin, *Zool. Jahrb. Syst.* vol. ix. p. 310 (1896).

Plate XVIII

Characters.—Height at shoulder about 26 inches or rather more (a specimen in the British Museum from Dorsetshire measures 27 inches, as mounted). Ears long, pointed, and comparatively thickly haired, both externally and internally. Antlers only moderately rugose. Pelage in summer thin, and at the early part of the season uniformly foxy red above, with-



EUROPEAN ROE IN SUMMER (1) AND WINTER (2) PELAGE.

NATIONAL MUSEUM FIELD NOTE

out any white on the rump, but paler on the under-parts; a blackish streak across the hairy portion of the muzzle, cutting the hinder part of the nostril and running to the angle of the mouth, and some small whitish markings in this region; front of face grizzled gray, darkest below the eyes; late in the season a buffish rump-patch produced, apparently by fading of the hair. Winter pelage very much thicker and coarser; general colour speckled yellowish gray-fawn, the hairs being gray at the base and rufous at the tips; a patch of pure white on the rump, including the region of the tail, but not extending markedly on to the flank; head, with the exception of the markings on the face, uniform grizzled gray. The metatarsal tuft is darker than either summer or winter coat.

Albino varieties of the roe have been recorded from Scotland and Germany. Ten or eleven inches is about the normal length for fair-sized horns, the maximum recorded by Mr. Rowland Ward being 13 inches. A pair from Austria measuring $15\frac{1}{2}$ inches in length are, however, mentioned in Bell and Alston's *British Quadrupeds*. Occasionally specimens are met with in which the front, or lower prong of the main fork is divided, thus producing four tines; and malformed antlers are of very frequent occurrence. The first antlers form a simple spike, and the second pair are forked once, with the hinder prong the longer; the third pair being three-tined. Young roes are fully spotted with white.

Distribution.—In suitable localities over the greater part of Europe as far as and including the Caucasus, and probably Asia Minor, but the exact easterly limits not determined. Although unknown in Ireland, the species occurs in England and Scotland, the south of Sweden, France, Germany, Austria, Hungary, Spain, Tuscany, Greece, Turkey, and Northern Palestine. In the



FIG. 60.—Head of Siberian Roe.
(Rowland Ward, *Records of Big Game*.)

British Isles wild roe are found in Scotland and some of the northern English counties, although they have long since been killed off from the south of England. Their remains are, however, abundant in the fens of Cambridgeshire and Lincolnshire, and have also been discovered in several English bone-caverns, as well as in the older "forest-bed" of the Norfolk coast, which belongs to the early part of the Plistocene period. In the early part of the century they were reintroduced into Dorsetshire, where they now flourish in the woods of the south side of the Blackmoor Vale; and some have been turned loose into Epping Forest and other districts in the home counties. Dr. Satunin states that the roe of the Caucasus is *C. pygargus*, but a small herd from that district at Woburn Abbey belong to the European form.

The roe is doubtless the animal known to Aristotle as *prox*, although in scientific literature that name has been applied to the muntjacs.

Habits.—The "bounding roe," as this deer is often termed, describes one of its most characteristic habits, as, at least when first starting, it always progresses by a series of long bounding leaps, with the head carried high in the air. Roe are generally found in pairs or small family portions, but never in herds. In Argyllshire Messrs. Harvie-Brown, and Buckley¹ state that a birch-clad glen of three or four miles in length rarely contains more than from two to four at any one time. Large woods with plenty of under-covert adjacent to grass or arable land are the haunts where they are most generally found. From these they sally forth to feed as evening approaches with great punctuality, usually making regular tracks to and from their feeding-grounds. In Scotland they are more abundant in plantations than in natural copses. They take readily to the water, both of their own accord and when pursued. After the bounding gallop in which they start off, roe generally settle down to a kind of trot, and at no time is their pace very great. Their leaping powers are, however, almost unrivalled for their size. The cry has been described as a kind of harsh bleat. Like most of the deer tribe, roe will both graze and browse, and they are also stated to eat fungi in autumn. The antlers of the old bucks are shed about the end of the year, and the new pair generally free from the velvet towards the latter part of February. The pairing-season does not, however, take place till July or August, the fawns being born about the following

¹ *Vertebrate Fauna of Argyll and the Hebrides*, p. 33 (1892).

May. There may be either one or two of these latter produced at a birth; and the older writers state that in the case of twins they are always male and female. The buck strictly confines his attentions to a single doe; and it appears that the union is renewed for several seasons, if indeed it does not last for life. In defending her helpless young, which are carefully concealed among thick covert, the doe displays great boldness.

When their curiosity is specially excited, roe exhibit even more boldness than the generality of deer, as is well illustrated by the following anecdote vouched for by Messrs. Harvie-Brown and Buckley in the volume already cited. "For nearly twenty minutes," they write, "a buck, close to Glenborrodale Castle, Ardnamurchan, stood within fifteen yards of where three gentlemen were seated. They carefully abstained from moving in the slightest degree. The buck stamped his feet, and went round them in half circles, and not until he at last got wind of them did he fly. Then he rapidly wheeled round, and with a snort of alarm disappeared in the thick wood."

Nomenclature.—With regard to nomenclature, the European roe by many modern naturalists would be termed *Capreolus capreolus*. Not admitting this combination, the earliest post-Linnean name applied to the living form has been selected; but this is antedated by the name *fossilis* given to fossilised remains, and this accordingly has the right of priority, although its application to a living species would be unsatisfactory, even if it really rank as a specific title.

2. THE SIBERIAN ROE—CAPREOLUS PYGARGUS

Cervus pygargus, Pallas, *Reise Russ. Reichs*, vol. i. p. 453 (1771); Noack, *Humboldt*, vol. viii. p. 7 (1889).

Cervus alu, Gmelin, *Reise Russ.* vol. iii. p. 496 (1780).

Cervus (*Capreolus*) *pygargus*, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 122, v. p. 314 (1827).

Capreolus pygargus, Gray, *List Mamm. Brit. Mus.* p. 176 (1843), *Cat. Ungulata Brit. Mus.* p. 223 (1852), *Cat. Ruminants Brit. Mus.* p. 82 (1872); Gloger, *Handbuch Naturgeschichte*, p. 141 (1841); Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 353 (1873), lxx. part i. p. 248 (1874); Brooke, *Proc.*

Zool. Soc. 1878, p. 917; Ward, *Records of Big Game*, p. 54 (1896); Satunin, *Zool. Jahrb. Syst.* vol. ix. p. 310 (1896).

Characters.—Closely allied to the last, but of larger size, the height at the shoulder, according to Pallas and Brandt, varying from about 28 to 34 inches. Ears relatively shorter, wider, less pointed, and much more thickly haired, both externally and internally. Antlers larger, more divergent, and much more rugose on the inner border, where they form a series of small irregular, nodular snags. Winter pelage much thicker and



FIG. 61.—Antlers of Siberian Roe. From a photograph lent by Mr. Carl Hagenbeck.

rougher than in the European species, being quite shaggy on the sides and lower portion of the head, chest, and under-parts; the back, which is coloured a mixture of yellowish and grayish brown, is more distinctly speckled with blackish, and the white rump-patch extends in a short V on to the flanks. The summer coat is a brighter and lighter rufous, with the hairs lying more smoothly; when first donned it shows little or no signs of a light rump-patch, but, apparently by fading, a yellowish white disk gradually develops in this region as the season advances. The face-markings are generally similar to those of the European species. Other features

are the slightly larger size of the face-glands, the more distinct development of the tail, and the shorter and broader hoofs.

In referring to this form, Sir Victor Brooke writes as follows :—" Most authors have considered *C. pygargus* to be a large variety of the common roe. There are, however, in the British Museum two specimens purchased from Brandt, and said to be from Siberia, which, in their very much larger size, larger anal disk, and much more hairy ears, differ widely from all specimens of the common species. Specimens of roe from Mantchuria in



FIG. 62. Abnormal Antlers of Siberian Roe. From a photograph lent by Mr. Carl Hagenbeck.

the British and Paris Museums are very much smaller than the above-mentioned specimens ; they also differ from the larger specimens and the common roe in some details of coloration. It is not improbable that the Mantchurian roe may prove to be a third modification of the form."

With regard to Brandt's specimens in the British Museum, one formerly exhibited in the mammal gallery is not, as mounted, so tall as a roe from Dorsetshire in the Museum, as it measures only 26 inches at the shoulder. This is, however, very probably due to faulty taxidermy, as the skin is evidently that of a much larger animal, and appears set up in too bulky a form. In all its characters it agrees with the descriptions given by

Pallas, Brandt, and Noack, and undoubtedly indicates a distinct form,—whether a species or sub-species being immaterial.

The antlers, which are always recognisable by their great rugosity and the rugged processes on the inner edge of the beam, are subject to great variation. In some cases, as shown in Fig. 62, they develop a kind of palmation on the hinder branch of the main fork, the front branch of which may be forked. They then exhibit a decided approximation to the American deer of the *Blastoceros* group of *Mazama*, to which genus there is reason to believe the roes are related.

A large, long-legged hind of this species from Siberia living at Woburn Abbey in 1897 showed a very bright summer coat, with no trace of the white caudal patch at the beginning of the season. Roughly speaking, the size of this hind might be compared with that of a fallow deer.

The following dimensions of antlers which may be safely assigned to this species are recorded by Mr. Rowland Ward, all being apparently from Siberia :—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.
15	$4\frac{3}{4}$?
$14\frac{1}{6}$	4	?
$13\frac{3}{4}$	3	6
$13\frac{3}{8}$	4	$9\frac{1}{2}$
2	4	$8\frac{7}{8}$

Distribution.—In suitable localities from the Altai range and the mountains of Turkestan to Siberia; probably also the mountains of the Caspian provinces of Persia, where it is known as the ahu. In Siberia not extending so far north as some of the species of *Cervus*, the northern limit being about the 53rd or 54th parallel of latitude, and not ranging as far as the mouth of the Amur river. During winter, migrating south into Manchuria, and apparently Corea. The alleged occurrence of this roe in the Caucasus is referred to on page 226.

As regards the above-mentioned localities, a skin of a big female roe from Corea recently obtained by the British Museum appears too large for the next species, and is accordingly referred to the present form. The pelage is that of winter; the general colour being a pale brownish fawn, with an irregular broad darkish band running down the middle of the back,

and expanding as it joins the pure white tail-patch, the under-parts being decidedly lighter than the back.

Habits.—The following particulars of the habits of this species in Siberia, partly furnished by Herr Dörries, have been published by Professor Noack.¹ According to these notes, the replacement of the winter by the summer pelage generally takes place about the latter part of April, although dependent to a certain extent on the season ; and by the end of September the winter dress is once more resumed. The pairing-season is somewhat later than in the European species, not taking place till September ; and during this period the bucks utter a louder and deeper toned cry than the former. Indeed, as might have been expected from its superior size and weight, the Siberian roe is an altogether more courageous animal than its Western cousin, and will not hesitate to charge dogs. In summer it affects copses and open meadows, where it can wallow in the marshes or swim in the neighbouring lakes ; but as winter comes on it retires to the protected mountain forests, and is fond of consorting with the herds of larger deer which then seek the same asylum. When the snows of November fall, the roes themselves commence to collect in herds, which may number from 300 to 500 head, and soon after migrate southwards into Manchuria, whence they return about the end of March or beginning of April. On the Ussuri, which they must cross, they are at this season slaughtered in thousands by the hunters, without regard to age or sex. In the year 1882, however, when snow only fell locally, no such migrations took place, and the roes only collected in small parties, and not in large herds.

3. THE MANCHURIAN ROE—CAPREOLUS MANCHURICUS

Cervus pygargus mantschuricus, Noack, *Humboldt*, vol. viii. p. 9, fig. 12 (1889).

Characters.—Considerably smaller than the last, and more like the European species, but distinctly red in winter. Antlers more slender than in the Siberian roe, although with the same general form ; and the winter pelage shorter. According to Professor Noack, the coloration (? in winter) is as follows :—Forehead whitish yellow, nose umber-brown, region round the eye very light, cheek reddish yellow, neck yellowish red umber-

¹ *Der Weidmann*, 21st August 1891, p. 419.

brown ; ear more yellowish gray than in the European roe, but the coloration of the lips very similar, with the exception that the dark spot on the lower one is very small, and the white band on the upper one broader. Specimens at Woburn Abbey were distinctly red in the middle of winter, and thus quite unlike the European roe at the same season. The probable distinctness of this form was first pointed out by Sir Victor Brooke, although I have been unable to identify the skin in the British Museum to which he refers (p. 229), and have had no opportunity of seeing the Paris specimen, or specimens. A roe from Manchuria (from the same district as the Pekin sika) living in the menagerie at Woburn Abbey in 1897 was a much smaller animal than the Siberian species. Two pairs of antlers in the British Museum from Manchuria recorded by Mr. Rowland Ward respectively measure $13\frac{1}{4}$ and $11\frac{3}{8}$ inches in length ; the former being only a little larger than fine specimens of the European roe.

Distribution.—The mountains of Manchuria. According to Professor Noack, these roe never come down into the plains, neither do they make the southerly winter migrations undertaken by the preceding species in Siberia ; and they never collect in large herds.

4. THE PLIOCENE ROE—CAPREOLUS CUSANUS (*Extinct*)

Cervus cusanus, Croizet and Jobert, *Oss. Foss. Puy-de-Dôme, Cervidæ*, plate viii. (1828) ; Dawkins, *Quart. Journ. Geol. Soc.* vol. xxxiv. p. 404 (1878).

Cervus (Capreolus) cusanus, Depèret, *Bull. Soc. géol. France*, ser. 3, vol. xii. p. 270 (1884).

Cervus (Capreolus) neschersensis, Depèret, *op. cit.* p. 272 (1884).

Capreolus cusanus, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 75 (1885).

Characters.—Apparently of the approximate size of the European roe, but with the antlers more flattened (? partly the effect of crush), rugose only at the base, with the main fork nearer the middle of the length, and the two tines of the second fork less divergent. The length (apparently in a straight line) of an antler figured by Professor Dawkins is 11.4 inches, and its basal circumference 2.8 inches. The same writer considers that this species is the direct ancestor of the European roe, and that it is itself the descendant of a still earlier species (*C. matheroni*) from the lower Pliocene

deposits of Greece and France. In the latter kind the main fork of the antler is placed still lower down, so that the undivided portion of the beam is less than a third the total length of the antler; the front prong of the main fork being relatively longer. I can find no sufficient characters for regarding *C. neschersensis*, which occurs in the same beds, as distinct from the present form.

Distribution.—France during the later part of the Pliocene period, the typical localities being Perrier and Ardé in the Department of Puy-de-Dôme.

X. THE MILOU DEER—GENUS ELAPHURUS

Elaphurus, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. x. p. 380 (1866); Gray, *Cat. Ruminants Brit. Mus.* p. 82 (1872); Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 328 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 906, as a sub-genus of *Cervus*.

Characters.—Lateral metacarpal bones as in *Cervus*, that is to say, represented by their upper extremities. Antlers large and cylindrical, with the beam making a marked angle with the plane of the face; no brow-tine or sub-basal snag, the beam dichotomously forking at a comparatively small distance above the burr; the front, or upper prong of the main fork curving forwards and again dividing once or more, the posterior, or lower prong long, straight, simple, and projected backwards. Muzzle with a large naked portion, which is deeper and broader below the nostrils than in the elaphine group, but extends only a little on to the front of the face, where its upper border is deeply concave; ears small and narrow; tail very long, cylindrical, and bushy at the extremity; neck maned in the male; face long. Pelage of adult uniformly coloured throughout the upper-parts; in young spotted. No tarsal tuft. Metatarsal tuft continuous and situated in the upper third of the metatarsus. The gland-pit in the skull large, and the face-gland also large. Main hoofs large and spreading; lateral hoofs very large. Upper canines small; upper molars moderately tall, with a small additional column on the inner side. The vomer not dividing the inner aperture of the nostrils on the under surface of the skull into two moieties. Size large; build heavy, with the limbs stout. No foot-glands.

Much difference of opinion has existed as to the systematic position of

this genus, of which only a single specific representative is at present known. By its describer, Professor A. Milne-Edwards, it was regarded as a very distinct form ; and this view was maintained by the late Dr. Gray, who placed it between the roes and the American deer. Professor Fitzinger likewise regarded it as entitled to generic distinction, but located it in the neighbourhood of the rusine deer. On the other hand, Mr. Sclater, while separating the fallow deer as a genus apart, includes *Elaphurus* in *Cervus* ;



FIG. 63.—Père David's Milou Deer in the Park at Woburn Abbey. From a photograph by the Duchess of Bedford.

and his view was followed by Sir Victor Brooke, with whom most other subsequent writers have agreed. Mr. A. Gordon Cameron, basing his conclusions on the structure of the antlers, has, however, revived the view of Dr. Gray, and there is little doubt that he is correct in so doing. If antlers count for anything in classification—and it is almost impossible to deny that they do so—the genus has nothing to do with any of the living Old World deer with the exception of the roes, while its alliance with the American deer seems close. Probably it is still more closely connected with the under-mentioned extinct types. That it differs from the American deer

in the structure of the vomer and the lateral metacarpal bones must be admitted ; but the backward production of the former bone in the American deer may probably be regarded as a specialised feature, and, as already said, I attach only minor importance to the lateral metacarpals. All who have seen the animal alive can scarcely fail to recognise how unlike it is, both in appearance and gait, to all the Old World deer of the present epoch ; and it



FIG. 64.—Five successive pairs of Antlers of a Père David's Milou Deer at Woburn Abbey. In 1897 this stag shed its antlers twice. Since the last pair photographed, it shed a pair like those of the second year, and by Christmas had grown a new pair like the last pair in the figure. Photographed by the Duchess of Bedford.

is probably more or less intimately related to the following extinct genus, which there seems good reason for regarding as also related to the ancestral stock of the modern American deer. To some of the latter the present genus approximates by the unusual length of its tail. Its geographical distribution also harmonises with its apparent affinity to the American deer, a large number of animals from North-Eastern Asia being more or less closely related to North American types.

Distribution.—The eastern portion of the Eastern Holarctic region.

PÈRE DAVID'S MILOU DEER—*ELAPHURUS DAVIDIANUS*

Elaphurus davidianus, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. x. p. 380, and *Arch. Mus. Paris*, vol. ii. p. 27 (1866) ; Gray, *Cat. Ruminants Brit. Mus.* p. 82 (1872) ; Fitzinger, *SB. Ak. Wien*, vol. lxx. part i. p. 329 (1874).

Cervus davidianus, Sclater, *Trans. Zool. Soc.* vol. vii. p. 333 (1871) ; Brooke, *Proc. Zool. Soc.* 1878, p. 906 ; Ward, *Records of Big Game*, p. 17 (1896).

Plate XIX

Characters.—Height at shoulder about 3 feet 9 inches, or nearly the size of a large red deer. Head large, with small eyes and ears, and a long, narrow muzzle ; limbs stout. Hair generally short and smooth, but longer on the middle line of the chest and under-parts, and on the neck and throat of adult males forming a mane. General colour of upper-parts reddish tawny with a tinge of gray, passing through an ill-defined darker band on the sides to a more decided whitish gray on the under-parts ; the neck, chest, and lower portion of throat dark brown ; on the neck and fore part of the back a blackish brown longitudinal stripe, and a similar stripe on the chest ; rump and inner side of thighs yellowish white, passing gradually into the general colour of the body ; outer side of upper part of limbs similar to the back, inner side and lower portion whitish yellow-gray ; tail like back, except the terminal tuft, which is blackish brown ; the face brownish, with a whitey brown patch round the eye, bordered on the inner side by a dark brown streak ; chin and inside of ears white, and a whitish oblique streak on the sides of the muzzle, above the nostrils. Female somewhat lighter coloured. Young reddish brown with a tinge of yellow, at first spotted profusely with white.¹

The following dimensions of antlers are recorded by Mr. Rowland Ward :—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.
$32\frac{7}{8}$	$6\frac{3}{8}$	$13\frac{5}{8}$	$18\frac{1}{2}$	8-8
$30\frac{3}{4}$	5	$35\frac{1}{16}$	$35\frac{1}{16}$	11-10
$28\frac{1}{4}$	$5\frac{3}{8}$	$26\frac{1}{2}$?	3-3
27	$5\frac{7}{8}$	$20\frac{1}{4}$?	6-5
22	$4\frac{5}{8}$?	?	4-3

¹ Brooke suggested that the young were unspotted, but this is disproved by the specimens born at Woburn Abbey.



PÈRE DAVID'S DEER.

NATIONAL MUSEUM OF MEDICINE

Distribution.—Northern China. The type specimen was obtained by Père David from the Imperial Park at Peking, and is now preserved in the museum at Paris. The London Zoological Society received a pair of specimens from the late Sir Rutherford Alcock in 1869, and a second pair were purchased in 1883. The male figured in plate xix is one living in the park at Woburn Abbey.

Habits.—By the Chinese this deer is known as mi-lou, a name which may be adopted as the English title for the genus. Nothing appears to be recorded of its habits in the wild state, and the following notes are from observations on the specimens at Woburn Abbey. In his notice of this species Mr. Sclater wrote as follows :—"The general aspect of the elaphure is much more like that of the true *Cervi* than I had anticipated from the description and figure of M. Milne-Edwards. The only two very noticeable points of distinction, besides the horns of the male, which are not at present shown in our animals, are the rather larger, heavier legs, the longer and more expanding toes, and the long tail. The latter character, however, seems to me to have been somewhat exaggerated in M. Milne-Edward's figures—the tail in our specimen not nearly reaching the hocks, and, though of somewhat different form, being little, if any, longer than that of the fallow deer and some of the American deer (such as the Virginian deer)." With these conclusions it is very difficult to agree, the general appearance of Père David's deer, when roaming at liberty in the park at Woburn Abbey, being quite unlike that of any other member of the group. Its gait is a kind of "lolloping" trot, recalling more the action of a mule than that of a deer; and its whole carriage, although almost impossible to describe, is totally unlike that of any other deer. In the Woburn specimens the tail reaches the hocks, and is decidedly longer than that of the fallow deer. The large spreading hoofs proclaim that these animals are in the habit of frequenting marshy ground, and at Woburn during summer they may frequently be seen wading far into the lakes, or even swimming in the deeper water. At this season their food consists chiefly of rushes and various other water-plants. The stags call in June and July; their cry being a kind of bray, more like that of a donkey than the call of other deer. The antlers are dropped during November or December.

XI. GENUS ANOGLOCHIS (*Extinct*)

Anoglochis, Croizet and Jobert, *Oss. Foss. Puy-de-Dôme, Cervidæ*, description of plate ii (1828), as a sub-genus¹; Pomel, *Cat. Méthodique*, p. 107 (1853).

Polycladus, Gervais, *Zool. et Pal. Françaises*, 2nd ed. p. 146 (1859), nec *Polyclados*, Brandt, 1835.

Eucladoceros, Falconer, *Pal. Mem.* vol. ii. p. 472 (1868), as a sub-genus.

Characters.—Lateral metacarpals unknown; antlers large, without a brow-tine, but with a sub-basal snag, above which the beam is dichotomously forked, one or both prongs of the fork again dividing once or more, and the whole antler forming a marked angle with the plane of the face; vomer unknown.

Although their conclusions have been rejected by M. Depèret, it appears evident that Messrs. Croizet and Jobert were perfectly justified in dividing the French Pliocene deer into a brow-antlered (*Catoglochis*) and fork-antlered group (*Anoglochis*), and there seems no good reason for separating Dr. Falconer's *Eucladoceros* from the latter of these, which was typified by *Cervus ramosus*. In all these deer, what has usually been described as the brow-tine of the antlers, is clearly comparable with the sub-basal snag of many of the existing species of *Mazama*, as may be seen by a comparison of the figures; and it is not till a greater or smaller distance above the origin of this snag that the antler makes its regular dichotomous fork. That these deer are generically distinct from *Elaphurus* seems probable from the conformation of the antlers; but, although it is perhaps unlikely that they are generically identical, yet until the nature of the lateral metacarpal bones and the relations of the vomer are known, it seems impossible to formulate a definition from the antlers alone by which they can be satisfactorily separated from the American *Mazama*. These deer indicate the probability of *Mazama* having sprung from an Old World type.

Distribution.—Western Europe during the upper Pliocene and early part of the Plistocene period.

¹ The text of this portion of the work was never published, and the generic and specific names appear only on the original covers.

I. THE ARDÉ DEER—*ANOGLOCHIS ARDEUS* (*Extinct*)

Cervus ramosus, Croizet and Jobert, *Oss. Foss. Puy-de-Dôme, Cervidæ*, plate iv (1828) ; Depèret, *Bull. Soc. géol. France*, ser. 3, vol. xii. p. 256 (1884) ; nec de Blainville, *Journ. Physique*, vol. xciv. p. 276 (1822).

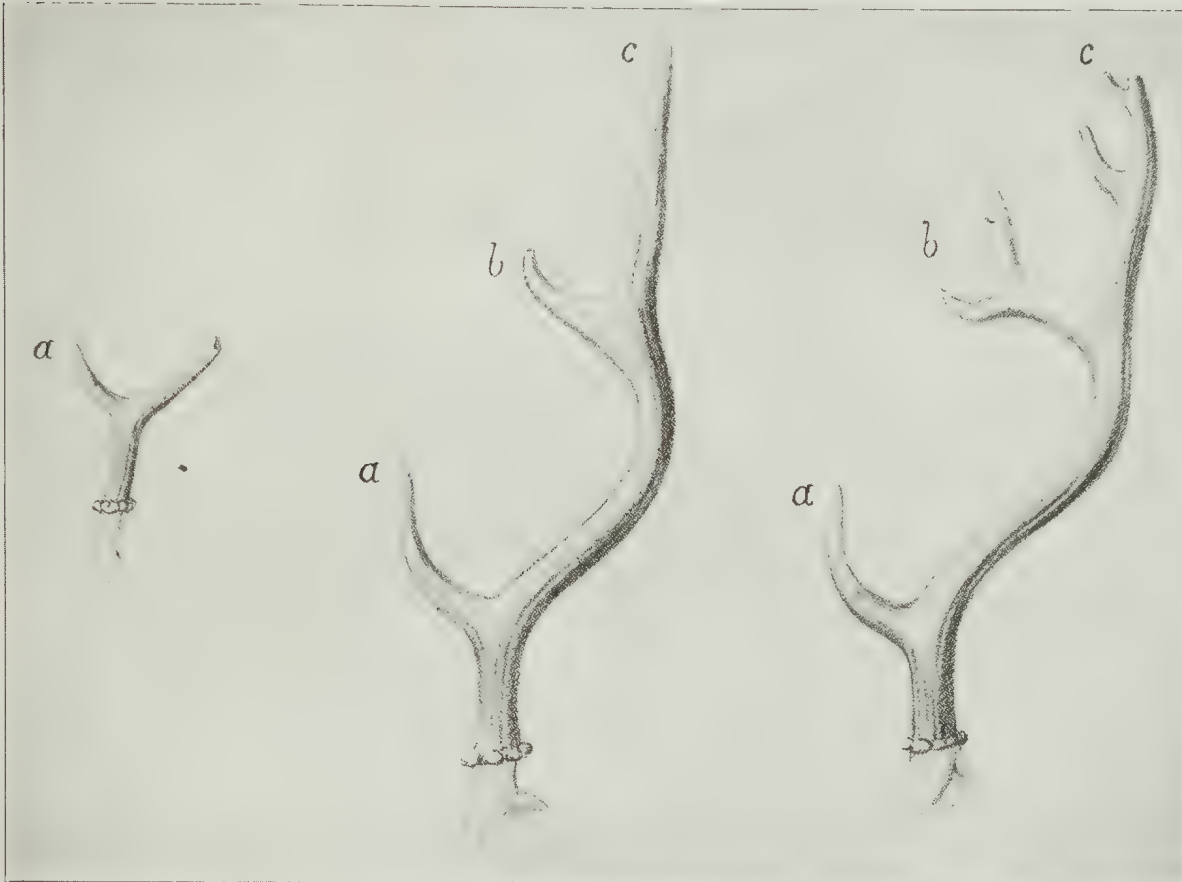


FIG. 65.—Antlers of Ardé Deer in three stages of development. *a*, sub-basal snag ; *b*, lower prong of main fork ; *c*, upper do. After Depèret.

Cervus ardeus, Croizet and Jobert, *op. cit.* plate ii (1828) ; Depèret, *op. cit.* p. 255 (1884).

Cervus polycladus, Gervais, *Zool. et Pal. Françaises*, 1st ed. p. 82 (1848-52).

Cervus ambiguus, Pomel, *Cat. Méthodique*, p. 107 (1853).

Cervus cladoceros, Pomel, *op. cit.* p. 108 (1853).

Cervus cylindroceros, Dawkins (ex Bravard), *Quart. Journ. Geol. Soc.* vol. xxxiv. p. 414 (1878) ; Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 111 (1885).

Cervus borbonicus, Depèret (ex Bravard), *Bull. Soc. géol. France*, ser. 3, vol. xii. p. 260 (1884).

Characters.—Antlers of medium size with the beam rising for a short distance straight till it gives off a short sub-basal tine, then curving strongly and continuing undivided for a considerable length, after which it forks dichotomously, and each prong of the fork thus formed again divides. In younger specimens the two prongs of the main fork are undivided; but in very old individuals the complexity is greater.

I believe that *C. ardeus*, which was founded on an antler in which the beam palmates and divides into three tines, instead of forking dichotomously, is merely a somewhat abnormal form of the antlers described as *C. ramosus*. There appear no sufficient characters by which the *C. borbonicus* of M. Depèret, which is the same as the *C. cylindroceros* of Professor Dawkins, differs from immature antlers of the present form. While *C. ramosus* and *C. ardeus* are assigned by M. Depèret to a separate extinct group (*Polycladus*), *C. borbonicus* (*cylindroceros*) is referred both by him and Professor Dawkins to the rusine group, with which it has obviously no affinity. M. Depèret has suggested some relationship between the present species and both the American deer and Sedgwick's deer.

By comparing the figures here given with those of the antlers of the Virginian deer in Fig. 69, it will be seen that the two agree in the position and size of the sub-basal snag, in the curvature and length of the beam before forking, and also in the splitting of both prongs of the main fork; and they may therefore be regarded as occupying analogous positions in their respective genera.

Distribution.—France, and perhaps other parts of Europe, during the latter portion of the Pliocene period, the chief localities being Ardé, Bourbon, and Perrier, in the Department of Puy-de-Dôme.

2. SEDGWICK'S DEER—*ANOGLOCHIS SEDGWICKI* (*Extinct*)

Cervus (*Eucladoceros*) *sedgwickii*, Falconer, *Pal. Mem.* vol. ii. p. 472 (1868); Depèret, *Bull. Soc. géol. France*, ser. 3, vol. xii. p. 259 (1884).

Cervus dicranus, Rüttimeyer (ex Nesti), *Abh. schweiz. pal. Ges.* vol. vii. plate i (1880) x. p. 106 (1883).

Cervus sedgwicki, Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 93 (1885).

Characters. — Antlers very large and complex, giving off a long, upright, forked, sub-basal snag a short distance above the burr, the beam soon after forking dichotomously, the upper prong of the fork again dividing, with one branch simple and the other forked, and the

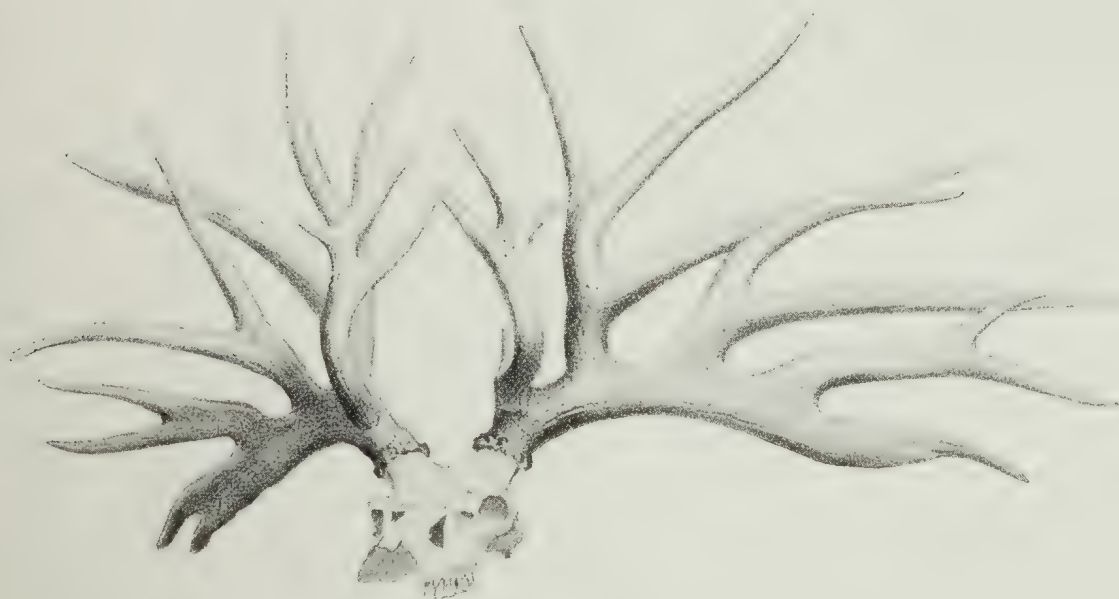


FIG. 66.—Skull and Antlers of Sedgwick's Deer. The innermost upright forked prong is the sub-basal snag, a short distance above the origin of which the beam splits into the main fork. In life the lower branch of this fork probably curved forwards. From Rüttimeyer.

lower prong of the main fork also splitting and both its branches dividing.

In the shorter length of beam between the giving off of the sub-basal snag and the main fork this magnificent species comes nearer to the mule-deer type, although the sub-basal snag is much longer. If the accompanying figure be compared with the front views of the antlers of the Virginian and mule-deer, the homology of the various elements will be clearly evident; and it is difficult to believe that the two forms are not related.

Distribution.—England and Italy during the latter part of the Pliocene and early portion of the Plistocene periods, the British remains occurring in the Norfolk forest-bed.

3. THE FIVE-TINED DEER—*ANOGLOCHIS TETRACEROS* (*Extinct*)

Cervus tetraceros, Dawkins, *Quart. Journ. Geol. Soc.* vol. xxxiv. p. 416 (1878); Lydekker, *Cat. Foss. Mamm. Brit. Mus.* part ii. p. 113 (1885).

Characters.—Antlers smaller and simpler than in the last species, giving off a long, undivided sub-basal snag a short distance above the burr, the beam soon after forking and probably curving forwards; the lower prong of the main fork simple, the upper divided, and its anterior division again splitting.

This species was established upon the evidence of a series of shed antlers in the British Museum which are crushed flat, and thus give the impression of a straight beam carrying four upright tines on its upper surface. The restoration is consequently somewhat difficult, but there seems little doubt that the first tine represents the sub-basal snag of the antlers of the Virginian deer, and that the beam was then suddenly bent forwards. It would thus show four upwardly projecting tines, of which the first two would be the prongs of the main fork. The annexed figure has been formed by taking the adult antlers and drawing them with the same curvature as those of the Virginian deer, and a comparison with the figures of the latter will leave little doubt as to their essential similarity. Indeed, they might well belong to the same genus. That these antlers are also structurally similar to those of Sedgwick's deer, will likewise be apparent from a comparison of the respective figures, the difference being that whereas in the present species each of the five tines is simple, in Sedgwick's deer all but the terminal one bifurcate; the one type being evidently only an earlier and simpler form of the other. In younger examples of the antlers of this species there are only four tines, and in still younger ones three; that is to say, each antler consists of a short sub-basal snag and a simple dichotomous fork, as in young antlers of the Virginian deer. As age advances the sub-basal snag increases in proportionate size till it becomes nearly as large as the true tines. Very young antlers are simply forked, and are then strikingly like those of young American deer. In his original description Professor Dawkins rightly compared the present form with the Virginian deer, remarking that the two were distinguished by the different position of the "brow-tine," that is to say, the

sub-basal snag; and adding that the fossil antlers curved forwards somewhat after the manner of those of the living species. In a restoration subsequently attempted they are, however, represented as inclining backwards.¹ About 27 inches is the length of the largest antler.

Distribution.—France, England, and probably other parts of Europe, during the latter part of the Pliocene and the early portion of the Plistocene period; the type specimens being from Peyrolles in the Puy-de-Dôme, and the English examples occurring in the Norfolk forest-bed.

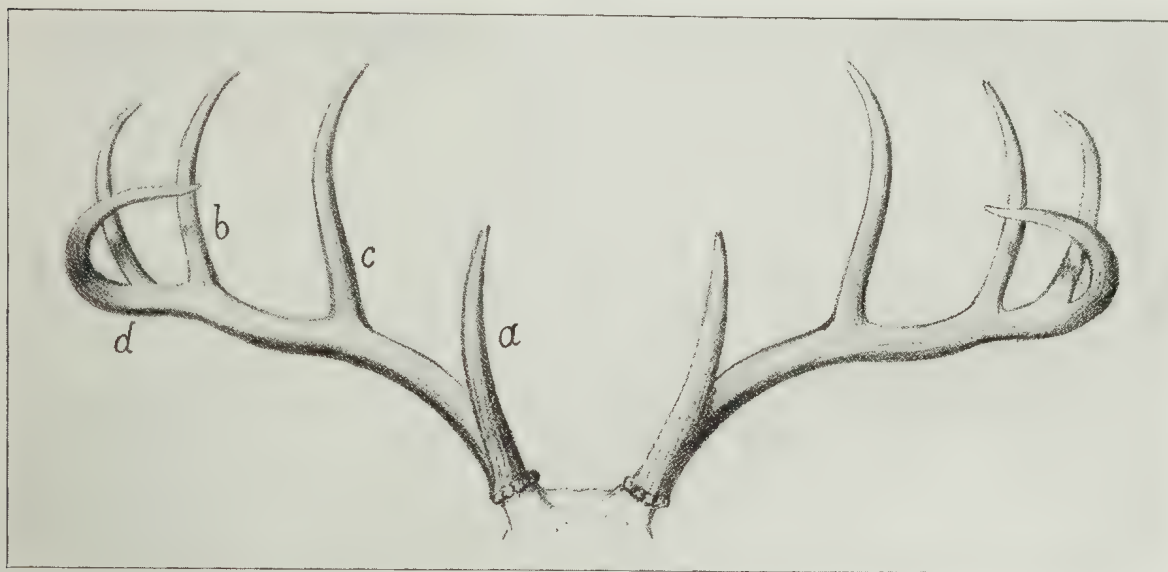


FIG. 67.—Restoration of Antlers of Five-tined Deer. *a*, sub-basal snag; *b*, lower prong of main fork; *c*, upper prong do.; *d*, terminal tines.

XII. THE AMERICAN DEER—GENUS MAZAMA

Mazama, Rafinesque, *Amer. Month. Mag.* vol. i. p. 44 (1817).

Characters.—Lateral metacarpal bones as in *Rangifer*, that is, with their lower extremities remaining. Antlers very variable in size, the beam forming a marked angle with the plane of the face, and without a brow-tine; when consisting of more than a simple undivided prong, dichotomously forked, frequently with a sub-basal snag, and always with the lower, or anterior prong of the main fork projected from the front edge of the beam, in some cases the lower, in others the upper (posterior), and in others both prongs again dividing. Muzzle with a large naked

¹ Dawkins, *Early Man in Britain*, p. 86, fig. 18 (1880).

portion ; ears and tail variable. Pelage of adult uniformly coloured ; in young usually spotted. A tarsal tuft present. Metatarsal gland and tuft, when present, very variable in form and position.¹ Gland-pit in the skull and face-gland very variable. Main hoofs long and pointed ; lateral hoofs well developed. Upper canines present or absent ; upper molars with or without a small additional column on the inner side. The inner aperture of the nostrils on the under surface of the skull divided by the thin longitudinal plate-like bone known as the vomer into two distinct chambers. Size medium or small.

All naturalists are agreed that the American deer form a very natural group, connected together by many common features, and differing in several respects from all the existing Old World deer. Different opinions are, however, held as to whether they should all (with the exception of the pudus) be included in a single genus, divided into several sub-generic groups, or whether such minor groups should be allowed the rank of genera. Gray and Fitzinger adopt the latter alternative, and Sir Victor Brooke the former. Mr. Sclater, in the *List of Animals in the Zoological Society's Gardens*, follows a middle course, including by far the greater number of the species in *Cariacus*, but separating the guemals as *Furcifer*.

To allow the minor groups the rank of distinct genera destroys to a considerable extent the unity of the whole assemblage, and thus renders its distinctness from all the existing Old World deer less apparent. And if, as is done in this volume, the typical brow-tined deer of the Old World are included in the single genus *Cervus*, then the groups into which the American deer are divisible should likewise be brigaded together in the single genus *Maxama*. If, on the other hand, it is thought advisable to allow the various groups into which *Cervus* is divided, such as *Pseudaxis*, *Dama*, *Rusa*, etc., to rank as genera instead of sub-genera, then the same course should be adopted in the case of the American deer, and the various groups here ranked as sub-genera should stand as genera. If this course be adopted, it would be necessary to divide the sub-family *Cervinæ* into several sectional groups, as otherwise the various genera would have very different values, some being very nearly related, and others much more widely separated.

¹ Brooke, *Proc. Zool. Soc.* 1878, p. 918, states that the metatarsal tuft is always situated in the lower third of the cannon-bone ; whereas in *M. columbiana* it is solely in the upper half.

Including, then, all these exclusively American deer in one genus, the next question is the name to be used. Except one, the earliest is *Mazama* of Rafinesque, but as this name included several animals, Dr. Baird in his *North American Mammals* (p. 665) urged that it should not be used at all, although it undoubtedly included some of the American deer. It was employed by Hamilton Smith in 1827 for the Virginian deer group, the brockets being separated as *Subulo*. According to Dr. C. H. Merriam,¹ the deer included by Rafinesque was one of the brockets, which by elimination becomes the type of the genus. If used at all, the genus must therefore be typified by the brockets; but if, as is done here, all the true American deer, except the pudus, are regarded as forming one genus, *Mazama*, as the earliest satisfactory name, may be employed for the entire group.

As already mentioned, there are at present no sufficient means of distinguishing from *Mazama*, in its widest sense, the Old World fossil deer constituting the genus *Anogloche*, although if the whole organisation of the latter were known, such might be found. *Anogloche*, it may be observed, antedates all names except *Mazama* and one other.

As noticed in the introductory chapter, and also on page 216, it has been generally considered that *Mazama* traces its origin to the extinct North American *Cosoryx* and *Blastomeryx*, but the extinct fork-antlered deer of Europe suggest that its origin was rather in the Old World, as it is difficult to realise the independent origin of such essentially similar types. Moreover, if the American deer originated in the New World from forms with permanent antlers, they must have developed the deciduous antlers independently of the deer of the Old World, which, as remarked by Messrs. Scott and Osborn, is somewhat difficult to believe.

Whether they were developed in the Old World or the New, it is evident that the American deer originated in the northern hemisphere, and that they are comparatively modern immigrants into South America, where they now attain their maximum development. For a long period, during which the isthmus of Panama was non-existent, the fauna of South America was quite unlike that of North America, and it was not till about the commencement of the Pliocene epoch that a land-connection was established which permitted the deer and other northern types of mammals to flow into South America. That the simple-antlered South American

¹ *Science*, ser. 2, vol. i. p. 208 (1895).

brockets are not the ancestral types of the American deer is evident from the fact that remains of these are unknown in North America, and that species with complex antlers of the type of those of the marsh-deer were already in existence at or about the time communication was established between the northern and southern halves of the New World; remains of such species occurring in the Pliocene beds of Monte Hermoso, in Argentina.

Rather must the brockets, as has already been pointed out by Mr. A. Gordon Cameron, be regarded as degraded, or arrested, types of the group.

A large amount of misconception has arisen with regard to the structure of the antlers of this group. In 1872 the late Dr. Gray rightly termed the single upright prong arising from the inner side of the lower part of the beam of the antlers of the Virginian deer the "sub-basal snag," but this snag Sir Victor Brooke incorrectly identified with the brow-tine of the typical Old World deer. This error has been pointed out by Mr. A. Gordon Cameron in the following words:—"These characteristic tines have nothing in common with the true brows of Old World types, and rise vertically from the inner side of



FIG. 68.—Side view of Antlers of Virginian Deer, from a specimen in the British Museum. The sub-basal snags are the long, upright prongs on the extreme left, passing up between the beam of each side at its bend.

the beam, between the coronet and the main furcation, usually converging at the apex. They are subject, in common with the antlers that produce them, to all kinds of eccentricities, are frequently forked and sub-palmate; and appear to bear an inverse relation to the calibre of the posterior prong. They develop with the second antlers of *C. leucurus*, but only with the later antlers of *C. macrotis*."

Regarding the different forms assumed by the antlers of the group, the same observer writes as follows:—"In the dominant type of the north the

anterior prong tends to become heavier than the posterior one, and the reduction of the calibre of the latter is accompanied by a proportionate development of the sub-basal snag. In the dominant type of the south the posterior prong tends to become heavier than the anterior one, and the sub-basal snags are not developed at all." The occasional forking of the sub-basal snag is parallel by the condition normally prevailing in the extinct Sedgwick's deer ; and the occurrence of that snag in the latter species and its allies, and its disappearance in the living Southern American forms is an important indication of the apparent relationship between *Anoglohis* and the northern types of *Maxama*. Moreover, it is only in these two latter that the great preponderance in the development and forward curvature of the anterior prong is noticeable. This ultra-development of the front prong tends largely to obscure the main dichotomous forking of the antlers, which is best displayed in those of the mule-deer and marsh-deer.

The division of the hinder aperture of the nasal aperture in the dry skull into two separate chambers by the vertical partition of the vomer is, as was first pointed out by the late Professor Garrod, a character possessed by the American deer and the reindeer, and one unknown in all other members of the family ; but it seems highly improbable that it indicates any intimate relationship between the two genera in question, being a peculiarity which might easily be developed independently.

In the possession of a tarsal gland and tuft on the inner side of the hock, the American deer differ from all the species of the genus *Cervus*. In such of them as have a metatarsal gland and tuft situated on the outer side of the metatarsus, this gland may be placed partially or wholly in the lower third of that segment of the leg ; and it is always of a more or less elongated form, with the hairs forming a distinct fringe round the naked gland, which may be exposed. In the mule-deer the fringe of hair bordering this gland is stated by Mr. Caton to be capable of erection during periods of excitement.

Distribution.—The Western Holarctic, Sonoran, and Neotropical regions, ranging from boreal North America to Patagonia.

i. THE DORCELAPHINE GROUP—SUB-GENUS DORCELAPHUS

Maxama, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 314 (1827), *nec* Rafinesque, 1817.

Dorcelaphus,¹ Gloger, *Handbuch Naturgeschichte*, p. 140 (1841, title-page dated 1842).

Cariacus, Lesson, *Nouv. Table Hist. Nat.* p. 173 (1842); Gray, *List Mamm. Brit. Mus.* p. 175 (1843), *Proc. Zool. Soc.* 1850, p. 237, *Cat. Ungulata Brit. Mus.* p. 33 (1852), *Cat. Ruminants Brit. Mus.* p. 82 (1872); Brooke, *Proc. Zool. Soc.* 1878, p. 918; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 47 (1881).

Reduncina, Wagner, in Schreber's *Säugethiere*, vol. iv. p. 373 (1844), as a sub-genus; Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. part i. p. 312 (1879).

Macrotis, Wagner, *loc. cit.* (1844), as a sub-genus, *nec* *Macrotis*, Dej. 1833.

Eucervus, Gray, *Ann. Mag. Nat. Hist.* ser. 3, vol. xviii. p. 338 (1866), *Cat. Ruminants Brit. Mus.* p. 85 (1872).

Otelaphus, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 356 (1873), to replace *Macrotis*.

Gymnotis, Fitzinger, *op. cit.* lxxviii. part i. p. 343 (1879).

Characters.—Antlers generally large and complex, with a sub-basal snag, and the lower, or anterior, prong of the main fork more or less developed at the expense of the upper, or posterior prong. Metatarsal gland and tuft usually present. Tail long or moderate, and hairy below. Face very long and narrow; the face-gland very small, and the gland-pit in the skull of moderate extent. Upper canines wanting. Size relatively large. Fawns normally spotted.²

Distribution.—The Western Holarctic, Sonoran, and northern portion of the Neotropical region.

¹ The priority of this name is pointed out by Mr. Thomas in *Ann. Mag. Nat. Hist.* ser. 6, vol. xv. p. 193 (1895), but Mr. Bangs, *Proc. Soc. Washington*, vol. x. p. 25 (1896), observes that "as *Dorcelaphus* is undoubtedly also antedated by other names, it seems advisable to keep the well-known name *Cariacus* until this point is definitely settled." The possibility of *Anoglochis* being the proper term, is mentioned on page 238.

² A Virginian deer hind at Woburn Abbey gave birth to a pair of fawns in 1897, one of which was spotted and the other uniformly coloured.

1. THE COMMON AMERICAN DEER—*MAZAMA AMERICANA*

Cervus dama americana, Erxleben, *Syst. Regn. Animalis*, p. 312 (1777).

Cervus virginianus, Boddaert, *Elenchus Animalium*, p. 136 (1785); Baird, *Mamm. N. America*, p. 649 (1857); Caton, *Antelope and Deer of America*, p. 100 (1877).

Cervus (Mazama) virginianus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 127, v. p. 315 (1827).

Cervus (Mazama) clavatus, H. Smith, *op. cit.* iv. p. 132, v. p. 315 (1827).

Mazama virginiana, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 176 (1835).

Dorcelaphus virginianus, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Cariacus virginianus, Lesson, *Nouv. Table Hist. Nat.* p. 173 (1842); Gray, *List. Mamm. Brit. Mus.* p. 175 (1843), *Cat. Ungulata Brit. Mus.* p. 228 (1852), *Cat. Ruminants Brit. Mus.* p. 83 (1872), *Hand-list Ruminants Brit. Mus.* p. 155 (1873); Brooke, *Proc. Zool. Soc.* 1878, p. 919; Alston, *Biol. Centr. Amer.—Mamm.* p. 115 (1879); Merriam, *Mammals of the Adirondacks*, p. 107 (1884); Ward, *Records of Big Game*, p. 55 (1896).

Cervus clavatus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 183 (1846).

Cervus capricornis, de Saussure, *Rev. Mag. Zool.* ser. 2, vol. xii. p. 252 (1860).

Reduncina virginiana, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. part i. 313 (1879).

Cervus (Cariacus) virginianus, Herrick, *Mamm. Minnesota*, p. 281 (1892).

Cariacus americanus, Bangs, *Proc. Soc. Washington*, vol. x. p. 25 (1896).

Dorcelaphus americanus, Rhoads, *Proc. Ac. Philadelphia*, 1897, p. 208; Mearns, *Proc. Soc. Washington*, vol. xii. p. 23 (1878).

Characters.—Build light and graceful, both body and limbs being long. Height variable, ranging from about 3 feet 1 inch at the shoulder to 26 inches. Antlers with a long sub-basal snag, above the origin of which the beam is abruptly curved forward, and soon after forks dichotomously, the posterior prong of the main fork upright and generally undivided, the anterior, or lower prong again forking, with its lower division also divided; the whole antler in advance of the sub-basal tine thus having the appearance of a horizontal beam with three nearly vertical tines arising from its

upper surface (Fig. 68). Ears relatively small and sparsely haired externally ; tail long and pointed ; muzzle very long and slender ; face-gland very small, and almost hidden by a fold of skin. Metatarsal gland, when present, small, sub-circular, and usually situated in the lower third of the cannon-bone, its centre being bare and black, the surrounding fringe of hair pure white, and this followed by an outer ring of fawn ; tarsal tuft large and whitish. General colour of summer pelage varying from bright rufous chestnut to yellowish fawn or gray on the upper-parts, in winter some shade



FIG. 69.—Front view of Frontlet and Antlers of Virginian Deer. From a specimen in the British Museum. The sub-basal snag is the innermost upright prong of each antler. (Rowland Ward, *Records of Big Game*.)

of yellowish leaden gray, faintly speckled, and often with a tinge of rufous ; under-parts, inner side of thighs and buttocks, part of inner and hinder side of fore-legs, lower surface of tail, chin, throat, lips, a ring round the eyes, and a band round the muzzle white. Fawn normally fully spotted with white. The case of the numerous forms allied to the typical Virginian deer is very similar to that of the sambar group, so that there is an equal difficulty in deciding whether they should be regarded as species or sub-species. In 1878 Sir Victor Brooke¹ wrote as follows in regard to this question :—"The number of specimens from well-authenticated localities at present existing in European collections is far

¹ *Proc. Zool. Soc.* 1878, p. 920.

too small to enable me to form any decided opinion respecting the degree of persistency of modification in the above-mentioned forms. Mr. Allen¹ has conclusively proved that a decrease in size and characteristic development takes place in all mammals, the centre of whose area of distribution is in North America, as they spread southwards ; and, so far as the materials at my command enable me to judge, I think it probable that the characters upon which *Cariacus leucurus*, *C. mexicanus*, *C. savannarum*, and *C. peruvianus* have been established as species may be in large measure the result of this law."

So far as specimens in the British Museum are concerned, the question scarcely admits of a more decisive answer now than then. There can, however, be no question but that all these forms are modifications of what is essentially one type of animal, and they are accordingly here regarded as sub-species rather than species ; an opinion shared by Mr. Rhoads, so far at least as the Mexican form is concerned, and adopted by Mr. Caton for most, and by Mr. A. Gordon Cameron for all the modifications. With regard to their relationship and distribution Dr. P. Matschie writes as follows :—"The two other kinds of Mazama deer found in South America are sufficiently well distinguished from *Cariacus peruvianus* ; *C. savannarum*, which probably inhabits the whole extent of the Orinoco area, is pure grayish brown with white speckling ; *C. gymnotis*, from the Magdalena River district, yellowish brown with grayer speckling. To the northwards, in Central America, *C. nemoralis* replaces *C. gymnotis* ; then follows in Yucatan and South Mexico *C. toltecus*, *C. mexicanus* in Texas and Mexico, *C. leucurus* in the Western, and *C. virginianus* in the Eastern United States."

Although several previous writers have referred to the decrease in bodily size and the diminution of the antlers in the members of this group as they are traced from north to south, they do not appear to have noticed two other features. These are a gradual darkening, and the tendency to the assumption of a permanently dark coat (*gymnotis* and *peruvianus*), and also to the disappearance of the metatarsal gland and tuft, which become rudimentary in *nemoralis*, and are quite lost in *toltecus*, *gymnotis*, and *peruvianus*. Both these are undoubtedly specialised peculiarities, the former being an example of that tendency to blackness in many animals inhabiting humid, and especially warm regions, to which reference has already been made in the introduction. Glands are frequently found in animals living in

¹ *Bull. U.S. Survey*, 1876, p. 304.

herds, and serve by their scent to enable the members to keep together. Virginian deer are certainly found in herds, and if some of the southern forms should prove to be less gregarious, a reason for the abortion or disappearance of the gland would be apparent.

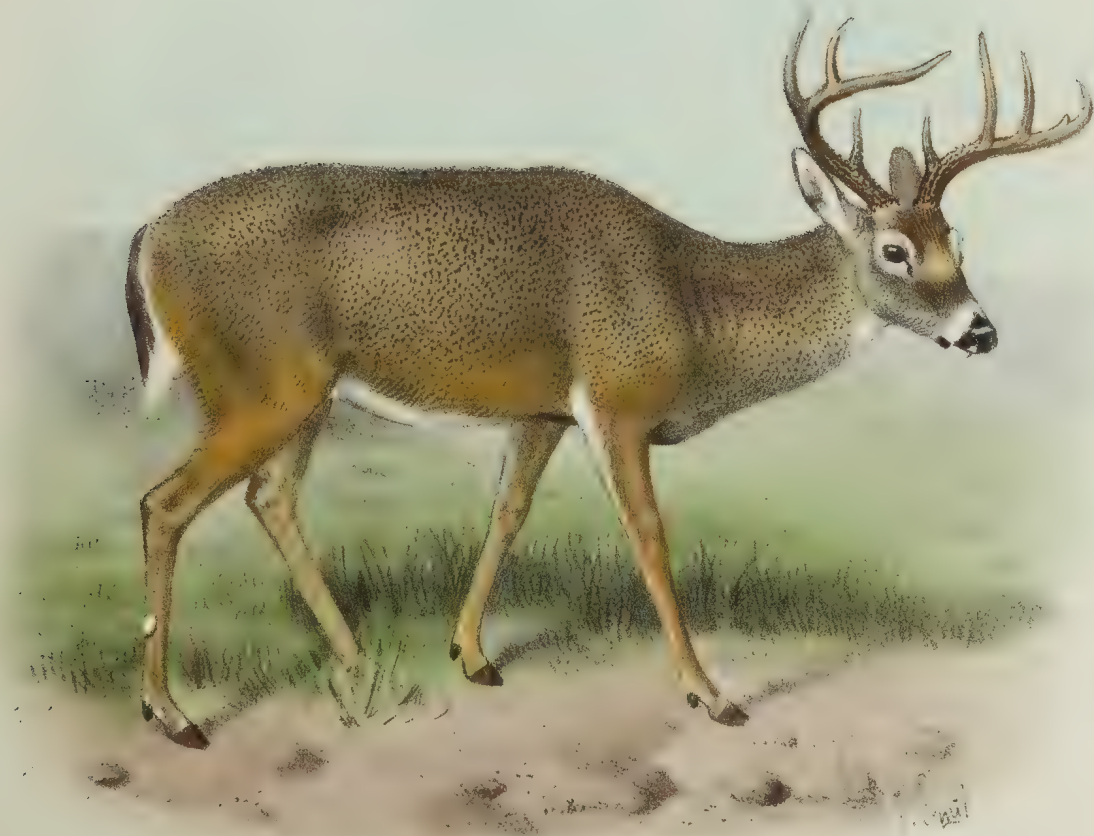
Whether regarded as species or sub-species, the various members of this group are best recognised by the peculiar characters of the antlers, the small ears, long tail, and, when present, by the small white metatarsal tuft. The antlers are subject to an extraordinary amount of individual variation, and in some of the smaller southern forms are so modified from the normal type as to be a little difficult of recognition, although they apparently always retain the large sub-basal snag. The specimen of which a side view is shown in Fig. 68 is a very characteristic one, and displays the great length of the latter snag and the undivided upper prong of the main fork. In the one of which the front view is represented in Fig. 69 the sub-basal snag is shorter, and the upper prong of the main fork divided. Should the numerous local variations be regarded in the light of distinct species, it would be necessary, in order to preserve some degree of equivalence in the divisions employed, to raise the mule-deer and the Columbian black-tail to the rank of a sub-genus (*Eucervus* of Gray), an alteration which would entail further modifications in the scheme of classification adopted throughout this volume, which is to minimise divisions so far as possible.

Distribution.—North America to Peru, Bolivia, and Guiana.

a. VIRGINIAN RACE—MAZAMA AMERICANA TYPICA

Plate XX

Characters.—Size large, the height at the shoulder reaching to about 3 feet 1 inch. Antlers large. Usual colour of pelage of upper-parts in summer bright rufous chestnut, with black markings on the face and tail; in winter speckled yellowish gray; a transverse black band on the chin; tail chestnut or gray above, white beneath, with more or less black at the tip on the upper surface. Metatarsal gland well developed, and situated low down on the leg. Even in this race there appears to be a considerable degree of colour variation. Mr. Caton observes that while in some examples there is no appreciable difference in the colour of the upper-parts and of the outer sides of the limbs between this race and the Columbian black-tail,



VIRGINIAN DEER IN WINTER PELAGE.

NATIONAL MUSEUM OF ETHNOLOGY

yet the rich russet shade of the latter is not common in the former. "In general there is a bluish shade observed on the common deer, which is so prevalent as to have given the winter coat the general appellation of the *blue* among hunters, who say the deer is in the *red* or the *blue*, as it may be in the summer or winter coat. But the difference in the depth of this colour is so very great, as well as the different shades of colour, as to surprise any one who will examine thirty or forty together. As the winter advances, all become appreciably of a lighter colour.

"On this deer the white which universally prevails on the under side of the head terminates with the throat, or just after it reaches the upper part of the neck. Thence the under side of the neck has no white, but is of the prevailing colour of the rest of the neck, until we reach the lower extremity. There commences a black, or, on some specimens, a brown stripe, which is always constant, and extends along the brisket to a line even with the posterior part of the fore-legs. On either side of this black stripe all is white, which extends down the inner side of the fore-legs to the knees. All of the belly is also a very pure white, embracing also the inside of the thighs and hind-legs to the hocks, and up to the tail." It is added that the white of the under-parts gradually widens from between the fore-legs to the abdomen. The extent of white on the lower part of the legs displays considerable individual variation ; some examples exhibiting a gray mark four or five inches in length on the inner front side of the fore-leg, terminating inferiorly in a point, below which it is separated by a tawny stripe from the white.

The following dimensions of antlers belonging to this and the next race are recorded by Mr. Rowland Ward :—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.
$27\frac{1}{8}$	$4\frac{3}{8}$	$14\frac{1}{4}$	19	6-6
$25\frac{3}{4}$	$4\frac{1}{2}$	9	19	11
$25\frac{3}{8}$	$4\frac{5}{8}$	$10\frac{3}{8}$	19	13-15
$25\frac{1}{4}$	$4\frac{3}{4}$	$12\frac{7}{8}$	$17\frac{1}{8}$	11-9
$24\frac{1}{2}$	$4\frac{1}{2}$	$12\frac{3}{8}$	$18\frac{1}{2}$	6-6
$24\frac{1}{2}$	$4\frac{1}{8}$	$11\frac{1}{8}$	$19\frac{1}{2}$	6-6
24	$4\frac{5}{8}$?	?	18
$22\frac{1}{2}$	4	?	?	12
$21\frac{1}{2}$	$3\frac{3}{4}$	$13\frac{1}{4}$	$13\frac{1}{2}$	4-4
$19\frac{1}{2}$	4	?	$19\frac{3}{4}$	12

Distribution.—Eastern North America, namely from Maine over much of the United States east of the Missouri river, typically from Virginia and Carolina, and probably ranging as far south as Louisiana.

Habits.—One of the most striking peculiarities in the habits of this beautiful deer is the manner in which it runs when first disturbed. This it does in a kind of rush, with the head carried very low, and the tail elevated over the back ; it never bounds after the manner of the mule-deer. By elevating the tail its pure white under surface is displayed ; and this, with the white of the inner surface of the buttocks, produces a conspicuous recognition mark. A full account of the habits of this deer in the Adirondack Mountains of New York has been published by Dr. C. H. Merriam, while Mr. Caton has contributed much important information as to its habits in captivity, and especially in regard to the periodical changes of coat. In spite of incessant persecution, a few years ago it was still the most abundant of the larger mammals in the Adirondacks, where it is found both high up on the mountains and in the valleys below. And it resorts alike to the thickest covert and to the open grass lands. During the warmer months of the year its diet is a varied one, comprising leaves and shoots of trees, various wild fruits, such as blackberries, grass, and aquatic plants ; beech-mast being very largely consumed in the autumn. So long as food of this nature is obtainable the deer thrive and keep in good condition ; but when the snow is on the ground, where it frequently lies for half the year, they are often hard pressed for provender. When beech-mast is abundant, and can be reached by scraping away the snow with their hoofs, they do fairly well ; but when the supply of this food is small, or the snow unusually deep, they are driven to browse on the twigs and shoots of various trees and shrubs, including both the deciduous kinds and conifers. A few mosses and lichens are also cropped when opportunity offers. Thin as they become towards the end of a hard winter, no sooner does the succulent marsh grass spring up in the lowland meadows than they rapidly regain good condition.

Although after the snow has melted in the forests and new vegetation is sprouting, the deer forsake the open meadows for the thickets, a large portion of their sustenance is obtained during the summer in the neighbourhood of water. And from June till the latter part of August herds of these deer visit the streams and lakes of the Adirondacks during the night, and return at daybreak to the shelter of the forests. To obtain the leaves and seed-pods

of the water-lilies, which form a very favourite article of food, they constantly wade long distances into the shallow waters, and will sometimes even venture out of their depth and swim. Here they suffer great persecution from flies and mosquitoes, which they apparently submit to as an unavoidable evil. Occasionally in the Adirondacks, and more commonly farther south, they enter the water when not in search of food, and will then stand with scarcely more than their eyes and nose exposed ; but whether they do this in order to rid themselves of insect torments, or merely to enjoy a bath, is very difficult to decide. Early in September, when the marsh plants in the Adirondacks begin to wither and die down, the deer forsake the neighbourhood of the water-courses for the forests, where a plentiful supply of food awaits them.

In places much frequented by man the deer in the Adirondacks feed chiefly or entirely by night, but in more sequestered districts they may be seen abroad at all hours of the day, and apparently repose at night. Their favourite resting-places are often under the low boughs of an evergreen shrub in some dense thicket, or beneath the protecting branches of a fallen tree. In the deep snows of severe winters the deer frequently collect in companies, and keep more or less open a limited space, or "yard," by constant trampling, in the same way as the American elk.

In the Adirondacks the new antlers of the bucks make their first appearance about May, and are generally free from the velvet by the commencement or middle of September. The pairing-season in the same district commences in the latter part of October and continues till the beginning of December. At this season the necks of the bucks swell in a remarkable manner, and their whole demeanour alters. They rush wildly through the forest in search of the does, fiercely attacking any members of their own sex with which they may happen to meet, and occasionally even charging human beings. From their peculiar shape, the antlers are exceedingly likely to become interlocked during such combats ; and not only have there been several instances of two bucks thus caught, but one case of three with their antlers interlocked is on record. In fighting, while the antlers form the chief weapons of offence, the front hoofs are also called into requisition, and inflict terrific wounds.

"I was once sitting quietly in a deer park," writes Dr. Merriam, "when a buck approached, and, making a sudden spring, dealt me such a

powerful blow on the head with the hoofs of his fore-feet, as to render me unconscious. No sooner was I thrown upon the ground than the vicious beast sprang upon me, and would doubtless have killed me outright had it not been for the intervention of a man who rushed at him with a club and finally drove him off. Both my father and myself have been knocked flat upon the ground by being struck in the abdomen by the fore-feet of a very harmless-looking doe."

The fawns are born in the Adirondacks between the latter part of April and the beginning of June ; two being the normal number at a birth and one the exception. The spots usually persist till September, when both young and old assume the winter pelage. The birth of an unspotted fawn at Woburn Abbey has been already mentioned.

With regard to the change of pelage, Mr. Caton writes as follows :—
"The change from the summer to the winter coat is gradual, the new displacing the old by dislodging the hairs promiscuously, till they become so thin that the new coat is seen through the old. This is not simultaneous over the whole animal, for the neck and shoulders may be clothed entirely with the new dress, while the old still prevails on the thighs and rump ; or the winter coat may have replaced the old on the back, while the belly still shows only the summer pelage. When the winter has replaced the summer garb, the hairs are short, fine, and soft ; but they rapidly grow in length and diameter, and undergo the change of colour peculiar to the species. At first they lie down smoothly, but presently the diameter becomes so great that they force each other up to a mere vertical position, or at right angles to the skin. As the diameters increase, the cavities within enlarge and become filled with a very light pith ; and the hairs become brittle and lose their elasticity, so that the integrity of the walls is destroyed when sharply bent, and they remain in the given position."

In the Adirondacks Dr. Merriam states that the time of changing the coat varies somewhat according to the season, and that it is not even constant in all the deer of any one locality in any particular season. The difference seems to depend largely upon the degree of severity of the winters, and the consequent good or bad condition of the animals. After an unusually hard winter, when the deer are half-starved, the change is delayed, and the red summer dress is not assumed till late in June or even the beginning of July ; the reassumption of the blue in autumn being

correspondingly retarded. On the other hand, after a mild winter, or one in which the supply of beech-mast has been plentiful, the summer change is early, the gray being soon shed, and the red coat covering the greater part of the animal by the middle of June, and sometimes even sooner. In such years the blue dress is likewise donned at an early date, the change being not unfrequently well advanced by the end of August. Whether the red summer dress is retained for a longer period in the hotter States, I have been unable to ascertain.

Although naturally timid in the extreme, Virginian deer, when taken very young, become exceedingly tame, and thrive well in confinement, if allowed sufficient space, both in the United States and in England. They breed readily, but in the United States, at least, display weakness of reproductive power after a few generations. Mr. Caton observes that if bucks are raised by hand, they are apt to become dangerous during the pairing-season, and are consequently unsafe to be allowed to run at large ; but if reared by their own mothers they never lose their instinctive fear of man, and consequently never show the least disposition to attack him, or to take food from his hand. This does not, however, accord with my experience of the numerous individuals kept at Woburn, where all exhibit extreme familiarity, and will readily allow themselves to be handled. Although allowed to run at complete liberty, they do not seem to associate at all with other deer, and only to a limited extent among themselves. One pair, for instance, frequent the neighbourhood of the house and stables, where they will come up unhesitatingly to every visitor to be fed or fondled ; while other pairs, or solitary individuals, take up their quarters in some particular portion of the park, from which they seldom wander.

b. WESTERN RACE—MAZAMA AMERICANA MACRURA

Cervus macrourus, Rafinesque, *Amer. Month. Mag.* vol. i. p. 436 (1817).

Cervus (*Mazama*) *macrourus*, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 134, v. p. 316 (1827).

Cervus leucurus, Douglas, *Zool. Journ.* vol. iv. p. 330 (1829) ; Baird, *Mamm. N. America*, p. 649 (1857) ; Caton, *Antelope and Deer of America*, p. 100 (1877), as synonym of *virginianus*.

Dorcelaphus macrurus, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Cariacus leucurus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842); Gray, *Cat. Ungulata Brit. Mus.* p. 230 (1852), *Cat. Ruminants Brit. Mus.* p. 83 (1872), *Hand-list Ruminants Brit. Mus.* p. 155 (1873); Brooke, *Proc. Zool. Soc.* 1878, p. 919.

Cervus (Mazama) leucurus, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 181 (1846).

Reduncina leucura, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. part i. p. 323 (1879).

Dorcelaphus virginianus macrourus, Allen, *Bull. Amer. Mus.* vol. vii. p. 257 (1895).

Dorcelaphus macrourus, Mearns, *Proc. Soc. Washington*, vol. xii. p. 26 (1898).

Characters. — Very similar to the last, but of slightly smaller size, rather paler colour, and no black on the face and tail. Antlers rather small and much bowed. General colour of summer pelage on upper-parts and outer side of limbs reddish brown, in winter bright grayish fawn with black specklings; tail fawn-colour, passing into rusty brown, above, pure white beneath and at the tip¹; tarsal gland yellowish brown.

Whatever may be the case with some of the under-mentioned forms, there can be no doubt as to the present one being merely a local race of *M. americana*, with the type form of which it probably intergrades. Mr. Caton, who includes both *leucurus* (*macrurus*) and *mexicana* under the heading of *americana*, observes that “in their northern range and in the mountainous regions of the west, the white portions cover a larger surface of the body than in other regions, where (in the west) they have been ranked by many naturalists as a distinct species under the name of *Cariacus leucurus*. By hunters these have been called the long-tailed, or white-tailed deer, the latter name having been used by Lewis and Clark, but in truth their tails are no longer than in those found in other regions. From the larger extent of white frequently, if not generally, found on them, we might possibly be justified in assigning them the distinction of a variety, though this peculiarity is by no means universal, for many individuals cannot be

¹ In Gray's *Catalogue of Ruminants* (1872) the tail of the Virginian race is stated to be white all round, with the tip brown above, and that of the present race reddish above; but this is not altogether correct.

distinguished from those found in Illinois or Wisconsin. I have one specimen from North-Western Minnesota with all the legs entirely white to several inches above the hocks and knees, with occasionally a tawny hair interspersed among the white. The white on the belly, too, extends further up the sides than is usually observed. This is exceptional, though not very uncommon in the north-west, but I have never seen it in their middle or southern range. I have never found any black on the tails or faces of the northern variety, while it is very common in more southern and eastern varieties."

The name long-tailed deer was doubtless applied to this race in contradistinction from other species, and not as distinctive from the eastern race. This has, however, misled Fitzinger, who speaks of the present race as differing from the eastern race by the greater length of the tail.

Distribution.—Western United States, including North California, Oregon principally east of the Cascade Mountains, Washington, Dakota west of the Missouri, and Nebraska.

C. FLORIDA RACE—MAZAMA AMERICANA OSCEOLA

Cariacus osceola, Bangs, *Proc. Soc. Washington*, vol. x. p. 26 (1896).

Dorcelaphus osceola, Mearns, *ibid.* vol. xii. p. 25 (1898).

Characters.—Scarcely more than half the size of the common *M. americana typica*, of the Eastern United States, with the pelage darker at all seasons, and differing less in summer and winter. There is a difference in the form of the maxillæ and nasals, and the cheek-teeth are larger. Mr. Bangs characterises this form as follows:—"Size small; general colour dark; hair short and fine at all seasons. Upper parts of back, neck, and head a mixed dark and light brown, each hair banded, dark brown at the tip, then yellowish brown, then dark brown, and Isabella colour at the base. The dark brown colour predominates in a narrow median band along the back, and is most intense on the neck and between the ears. On the flanks and along the sides the hairs are not banded, but are Isabella colour at base and cinnamon at tips; sides and under surface of neck cinnamon; throat, belly, inside of legs white; ears sparsely haired; upper surface dark brown, many of the hairs tipped with yellow; inside surface white; the

hairs of the upper side of tail are dark-red brown at base and cinnamon at tips ; under side of the tail white, the hairs very long ; eyelashes jet black. An old male, in worn midsummer coat, has lost the banding of the hairs and is a bright russet cinnamon above, which extends to the front of the eyes. The muzzle is very sparsely haired, and of a grizzled hair-brown colour, with a black spot behind each nostril. The tail is broadly edged with black at the base and black above at the tip. An old male from Blitches Ferry, Citrus County, Florida, in fresh autumnal pelage, is very dark above, the lower dark band of the hairs extending to their base and



FIG. 70.—Florida Deer. From a photograph by Mr. Rowland Ward.

imparting to the whole upper-parts a rich dark-brown colour, variegated by the yellow bands of some of the hairs ; tail not edged with black, but like that of the type. A half-grown female has the hairs of the back unbanded and is clay-colour above, beautifully marked with small irregular white spots." The limbs are longer, the antlers longer, the teeth larger, and the muzzle more elongated than in the next race.

Distribution.—Peninsula of Florida. Mr. Bangs writes that the Florida deer is of very general distribution over the whole of peninsular Florida, but in the more thickly settled and accessible parts of the State it has been much reduced in numbers of late. Its northern range is unknown to me, and I am therefore unable to state whether or not it overlaps the range of *M. americana typica*.

d. SONORAN RACE—MAZAMA AMERICANA COUESI

Cervus mexicanus, Baird, *N. Amer. Mamm.* p. 653 (1857), *nec* Lichtenstein, 1827-34.

Dorcelaphus couesi, J. A. Allen, *Bull. Amer. Mus.* vol. vii. p. 200 (1895).

Characters.—A very small, pale-coloured form (smaller than the Texan race), with relatively large ears, on the margins and tips of which there is no black; tail relatively long; and cheek-teeth small. Antlers small, with short tines.

Distribution.—Sonora, typically from the Santa Cruz Mountains.

e. TEXAN RACE—MAZAMA AMERICANA TEXANA

Dorcelaphus texanus, Mearns, *Proc. Soc. Washington*, vol. xii. p. 23 (1898).

Characters.—Size small; ears relatively small, with black on the margins and tips; general colour pale; pelage fine and long; limbs relatively short; and cheek-teeth large. Antlers small and strongly incurved.

Distribution.—Texas and North Mexico.

f. MEXICAN RACE—MAZAMA AMERICANA MEXICANA

Cervus mexicanus, Gmelin, *Syst. Nat.* vol. i. p. 179 (1788); Lichtenstein, *Darstell. Thiere*, plate xviii (1827-34); Caton, *Antelope and Deer of America*, p. 100 (1877), as synonym of *virginianus*.

Cervus (Mazama) mexicanus, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 315 (1827).

Mazama mexicana, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 175 (1835); Gray, *Knowsley Menagerie*, plate xlvi (1850).

Cariacus mexicanus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842); Gray, *Cat. Ruminants Brit. Mus.* p. 156 (1872), *Hand-list Ruminants Brit. Mus.* p. 156 (1873); Brooke, *Proc. Zool. Soc.* 1878, p. 919; Alston, *Biol. Centr. Amer. Mamm.* pp. 82, 113 (1879); Ward, *Records of Big Game*, p. 58 (1896).

Reduncina mexicana, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 357 (1873), lxxviii. part i. p. 328 (1879).

Cariacus virginianus mexicanus, Rhoads, *Amer. Naturalist*, vol. xxviii. p. 525 (1894).

Characters.—Size very much smaller than that of the typical race, the height at the shoulder in Lichtenstein's example being 2 feet 9 inches. Antlers smaller, but of the same general form as in the typical race. In Lichtenstein's example the coloration (season not stated) is described as follows. Upper-parts rusty grayish brown, without any distinct mixture of red, finely speckled with whitish, the individual hairs being whitish for the greater part of their length, then ringed with reddish brown, next with yellowish white, and the tips black; chest reddish brown; under-parts white; limbs above similar to back, inferiorly without speckling; lower jaw and throat whitish, without any dark markings on the former; tail yellowish brown speckled with whitish at the base of the upper surface, then more uniform rusty yellowish brown, and white at the tip and beneath; tarsal tuft brownish with a white border. The British Museum has recently acquired two skins of Mexican females, the one in summer and the other in winter pelage. In the former the general colour of the upper-parts is speckled foxy red, but the head and ears dark speckled gray, becoming tawny behind and below the ears; no white on the muzzle, but the chin, lower jaw, throat, and under-parts pure white; tail bright foxy red above, white beneath and at the margin. Metatarsal tuft very small. Possibly the gray head may be due to the assumption of the winter coat. The specimen in winter pelage is dark brownish gray, speckled with white, but the upper surface of the tail still bright rufous. The hair is much longer than in the summer specimen. These were received before the description of the Texan race, with which I have not had the opportunity of comparing them.

In one of Lichtenstein's examples the antlers measure $11\frac{1}{2}$ inches in length, but a pair in the British Museum reach $13\frac{1}{2}$ inches along the curve. Specimens with eight and ten, and in one instance with fifteen tines, are recorded from Mexico and Texas by Sir Victor Brooke; some of these belonging to the preceding race. The smaller specimen from Guatemala referred to by the same writer belongs to *M. americana nemoralis*, as do the Costa Rica examples described by Dr. Gray.

The specimens which must be regarded as the actual types are those described by Lichtenstein, and preserved in the Museum at Berlin, since Gmelin's *C. mexicanus* is a medley. On this point Mr. Rhoads observes that the *Cervus mexicanus* of Gmelin is based on the teuthlalmacame of Hernandez's *History of Mexico* (1651). The description of the latter does not apply to the prong-buck, as asserted by Berlandier,¹ and repeated by Alston. Hernandez's figure of the teuthlalmacame, whether intended for the deer or prong-buck (it partly fits both), cannot affect the description, which applies to the deer.

Distribution.—South Mexico.

g. YUCATAN RACE—MAZAMA AMERICANA TOLTECA

(?) *Cervus cariacou*, Wiegmann, *Isis*, 1833, p. 965; Pucheran, *Arch. Mus. Paris*, vol. vi. p. 366 (1852).

Cervus toltecus, de Saussure, *Rev. Mag. Zool.* ser. 2, vol. xii. p. 247 (1860).

Coassus toltecus, Gray, *Cat. Ruminants Brit. Mus.* p. 92 (1872).

(?) *Reduncina cariacou*, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. p. 334 (1879).

Cervus yucatanensis, Hays, *Ann. Lyc. N. York*, vol. x. p. 218 (1874).

Cervus acapulcensis, Caton, *Antelope and Deer of America*, p. 113 (1877).

Cariacus toltecus, Brooke, *Proc. Zool. Soc.* 1878, p. 921; Alston, *Biol. Centr. Amer.—Mamm.* p. 117 (1879).

Cariacus yucatanensis, True, *Proc. U.S. Mus.* vol. xi. p. 423 (1888).

Characters.—Size very small, apparently about one-third less than that of *mexicana*, but the tail relatively longer than in the latter. Antlers short, upright, nearly straight, and semi-palmate, with but little forward projection of the lower prong of the main fork, and the number of tines reduced. Metatarsal gland and tuft wanting. General colour of upper-parts dark chestnut-brown; face blackish; under-parts white; tail, which is truncated at the tip, brown above and white beneath. No seasonal colour-change.

The aborted antlers (figured on page 224 of Mr. Caton's book) and the want of the metatarsal tuft might be considered as sufficient evidence to raise this form—the acapulco deer of Mr. Caton—to the rank of a distinct

¹ See Baird, *Mammals of N. America*, p. 666 (1857).

species. But the antlers are essentially only a degraded type of those of the Mexican race, and too little is known of the functional importance of the metatarsal gland to render its absence necessarily a specific character. Moreover, its small size, or absence in the variety *nemoralis*, indicates a transition from the typical race to the present one.

Distribution.—Yucatan and part of Southern Mexico.

Habits.—Of the habits of this deer in a wild state I can find no record. In captivity, according to Mr. Caton, it displays great pugnacity, the bucks not hesitating to attack other deer of three times their size and weight, and beating them by sheer courage and pluck. They are hardy and breed readily, although it has not been ascertained for how many generations this will continue. Although living naturally in the torrid zone, they will withstand a temperature some degrees below zero, and thus present a remarkable contrast to the mule-deer and black-tail. Mr. True has suggested that de Saussure's *toltecus* is the same as *sartorii*, in which case *yucatanensis* will be the name of the present race.

h. CENTRAL AMERICAN RACE—MAZAMA AMERICANA NEMORALIS

Cervus (Mazama) nemoralis, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 137, v. p. 317 (1827).

Mazama nemoralis, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 175 (1835).

Cariacus nemoralis, Lesson, *Nouv. Table Hist. Nat.* p. 173 (1842); Gray, *Cat. Ungulata Brit. Mus.* p. 232 (1852); Matschie, *Mitt. geogr. Ges. Lübeck*, 1894, p. 130.

Cervus nemoralis, Pucheran, *Arch. Mus. Paris*, vol. vi. p. 336 (1852); Brooke, *Proc. Zool. Soc.* 1878, p. 919, as synonym of *mexicanus*.

Reduncina nemoralis, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. part i. p. 338 (1879).

Characters.—Apparently nearly allied to the last, but with the metatarsal gland usually remaining, although very small, with scarcely any white, and situated near the middle of the cannon-bone. A female from Guatemala mentioned by Victor Brooke (as *C. mexicanus*) measured $27\frac{1}{2}$ inches at the shoulder; and antlers from the same locality have six points. The following description of the coloration is given by Dr. Gray on the evidence of a

male and female from Costa Rica in the British Museum :—"Fur brown, punctulated with yellow ; forehead and crown blackish, with hair diverging from a central longitudinal line ; legs gray ; tail same colour as the back above, under side and tip white ; upper lip and hinder part of lower lip black ; spot on sides of nostrils and lower lip white ; a narrow white streak behind the brown on the nose." The antlers measured by Sir Victor Brooke have a length of $7\frac{1}{2}$ and a span of $8\frac{1}{4}$ inches. In two skins in the British Museum from Costa Rica (referred to in Gray's *Catalogue of Ruminants* as *C. mexicanus*) the metatarsal gland and tuft, although small, are distinct ; but in an example from Honduras in the same collection they are totally wanting. The slight value of this organ for classificatory purposes is, therefore, apparent.

Distribution.—Central America, from Honduras through Costa Rica and Nicaragua to Panama.

i. COLOMBIAN RACE—MAZAMA AMERICANA GYMNOTIS

Cervus gymnotis, Wiegmann, *Isis*, 1833, p. 965.

(?) *Cervus goudotii*, Gervais and Gay, *Ann. Sci. Nat.* ser. 3, vol. v. p. 93 (1846) ; Fitzinger, *SB. Ak. Wien*, vol. lxxix. part i. p. 67 (1879).

Cariacus gymnotis, Brooke, *Proc. Zool. Soc.* 1878, p. 921 ; Matschie, *Mitt. geogr. Ges. Lübeck*, 1894, p. 130.

Gymnotis wiegmanni, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 344 (1879).

(?) *Cervus columbicus*, Fitzinger, *op. cit.* vol. lxxix. p. 66 (1879).

Characters.—Height nearly the same as in the last (26 inches at the shoulder in the type), but the metatarsal gland and tuft wanting, the ears large, drooping, and almost naked externally, the head very narrow and pointed, and the general form slender and delicate. General colour of pelage of upper-parts yellowish brown speckled with gray at all seasons, the individual hairs being gray at the base, then brown and ochry, with black tips ; a dark streak from the crown of the head along the neck ; a grayish white ring round the eye ; yellowish white and brown spots on the forehead, a darker spot on the nose, and a patch on the upper lip, followed by a white streak reaching to the angle of the mouth ; chin white, with a dark streak reaching to the lower lip, and thence extended

to the angle of the mouth; under-parts pure white; tail pale reddish brown above, with the tip and lower surface white. The antlers appear to be very similar to those of the last, and measure just short of 7 inches in the type.

This deer, of which the type specimen is preserved in the museum at Berlin, seems to be one of the most distinct of the group, and was regarded by Sir Victor Brooke as probably entitled to specific rank, which view may be correct. It was raised to the rank of a genus by Fitzinger on account of the absence of the metatarsal tuft, but *toltecus* shows that such a distinction cannot be maintained. If the latter be classed only as a race, it seems almost necessary to follow the same course in the present instance.

Fitzinger's *C. columbicus*, founded on antlers described by Pucheran from Bogota, Colombia, is considered by its founder to be probably identical with *savannarum*, but the locality suggests the present form.

Distribution.—Colombia.

j. SAVANNA RACE—MAZAMA AMERICANA SAVANNARUM

Cervus savannarum, Cabanis and Schomburgk, *Reisen Brit. Guiana*, vol. iii. p. 785 (1848); Gray, *Cat. Ruminants Brit. Mus.* p. 84 (1872), as a synonym of *mexicanus*.

Reduncina savannarum, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 358 (1873), lxxviii. part i. p. 242 (1879).

Cariacus savannarum, Brooke, *Proc. Zool. Soc.* 1878, p. 920; Matschie, *Mitt. geogr. Ges. Lübeck*, 1894, p. 130.

Characters.—Another small, short-antlered race, of which the type is preserved in the museum at Berlin. In many respects it is stated to be intermediate between the Virginian and Colombian races, the general colour of the pelage being clear grayish brown speckled with white. From the former it differs by its greatly inferior size, smaller antlers, and shorter tail; from the latter by the hairy external surface of the ears and the presence of the metatarsal gland and tuft. The under lip is stated to be peculiar in having only a single dark spot on each side, totally unconnected with any other markings.

Distribution.—Guiana and probably the whole Orinoco basin.

k. PERUVIAN RACE—MAZAMA AMERICANA PERUVIANA

Cervus (*Coassus*) *peruvianus*, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xiii. p. 332 (1874).

Cariacus peruvianus, Brooke, *Proc. Zool. Soc.* 1878, p. 920 ; Matschie, *Mitt. geogr. Ges. Lübeck*, 1894, p. 129.

Characters.—Another nearly related small form, without a metatarsal gland or tuft, the type specimen of which is in the British Museum. General colour of pelage of upper-parts dark grayish brown, with whitish speckling, but the upper surface of the tail uniformly dark brown ; the individual hairs dark isabelline gray at the base, with a whitish band below the black tip ; under-parts whitish.

Since several skins of this deer preserved in the British Museum are all of the same colour, it is probable that the dark hue is persistent at all times of the year. Fitzinger states that the hair on the hinder half of the back is devoid of speckling, but this is not the case with the specimens in the British Museum.

Distribution.—Peru and Bolivia.

2. TRUE'S DEER—MAZAMA TRUEI.

Cariacus clavatus, True, *Proc. U. S. Mus.* vol. xi. p. 417 (1888), nec *Cervus clavatus*, H. Smith, 1827.

Characters.—A small deer, ranging from Tehuantepec in Southern Mexico to Costa Rica, has been described under the name of *Cariacus clavatus*, with the following leading characteristics. Size relatively small ; general appearance and colour very similar to *M. americana typica* ; antlers in the form of simple spikes directed backwards nearly in the plane of the face ; a small metatarsal gland present ; hoofs yellowish at the tip. General colour of pelage of upper-parts in summer bright chestnut, grayer on the head than on the back ; a white spot on each side of the nose, followed by a dusky brown band extending from the nostril to the margin of the upper lip, and continued by a spot on the border of the lower lip ; behind the dusky band another of gray, passing into dark gray behind ; a dusky brown streak down the middle of the face ; a crest of long reflexed

hairs on the forehead, darker in general tint than the hair of the face. Outer side of ear mostly gray, but a large white spot at the base; upper surface of tail tawny like back; under surface of lower jaw, throat, underparts, upper half of inner surface of limbs, and under surface and tip of tail white; rest of limbs nearly like the back. In winter the general colour speckled brownish gray ("pepper-and-salt.")

Mr. True is perfectly correct in regarding this deer as allied to the Virginian deer, and having no affinity with the brockets. And since it comes from the same region as *M. americana nemoralis*, with which it agrees in the presence of a small metatarsal gland, and apparently in the general coloration, the suspicion naturally arises that it is not separable from that subspecies. It is known that the Virginian deer has spike-like horns in the first year, which in rare instances may persist till the second year, and those of the present form might be an arrested development. But the skull, of which Mr. True has sent me an adult example, is quite different from that of all forms of the common American Deer. As *clavatus* is preoccupied by Hamilton Smith's *Cervus clavatus* (see p. 249), which is a synonym of *M. americana*, I propose the name of *Mazama truei*.

Distribution.—South Mexico to Costa Rica.

3. CROOKE'S BLACK-TAILED DEER—MAZAMA CROOKEI

Dorcelaphus crooki, Mearns, *Proc. U. S. Mus.* vol. xx. p. 468 (1897).

Characters.—This form, to which specific rank is only provisionally allowed here, was founded on a female specimen stated to present characters intermediate between the western race of *M. americana* and the mule-deer. The original description is as follows:—In the summer pelage. Colour reddish fawn, darker from black annulations on the back, lightening to grayish cinnamon on the sides, and grayish drab on the neck. The legs are cream-buff, except where new clay-coloured hair is coming in on the anterior border, the limbs being almost the last part to receive the summer coating. The colouring of the head is very similar to that of the mule-deer in corresponding pelage. It has the horseshoe, or arrow mark on the forehead, and other dark markings of the head to correspond; and the ears are relatively almost or quite as large, and as scantily [*sic*] coated with hair. The bushy hair around the metatarsal gland, which agrees in size and

location with that of *Mazama columbiana*, is sooty at base, and white apically. The tail is coloured much as in *M. columbiana*, but has a longer terminal switch; upper side and extremity of tail all black, lower side white mesially, and naked towards the base. The pelage of this deer is short and coarse in comparison with that of the white-tailed or Virginian deer, or the black-tailed deer of the Columbia River region; and, as would naturally be expected, is not so red as that of the latter. The skull has very nearly the same conformation as that of *M. columbiana*, the lachrymal pit being deeper than in the Virginian deer, but shallower than in the mule-deer. The same intermediate condition obtains with respect to the vomer, in the relationships of the nasal and premaxillary bones, in the form and size of the teeth; and, in short, the whole animal appears to be a compromise between the characteristics of the white-tailed and mule-deer. Is it possible that it may be a half-breed between the two?

Distribution.—Dog Mountains, Grant County, New Mexico.

4. THE MULE-DEER—*MAZAMA HEMIONUS*

Cervus hemionus, Rafinesque, *Amer. Month. Mag.* vol. i. p. 436 (1817).

Cervus auritus, Desmarest, *Mammalogie*, vol. ii. p. 443 (1822).

Cervus macrotis, Say, in Long's *Exped. Rocky Mountains*, vol. ii. p. 83 (1823); Caton, *Antelope and Deer of America*, p. 93 (1877).

Cervus (Mazama) macrotis, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 133, v. p. 316 (1827).

Mazama macrotis, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 175 (1835).

Dorcelaphus macrotis, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Cariacus macrotis, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842); Gray, *Proc. Zool. Soc.* 1850, p. 239, *Cat. Ungulata Brit. Mus.* p. 234 (1852); Brooke, *Proc. Zool. Soc.* 1878, p. 921; Alston, *Biol. Centr. Amer.—Mamm.* p. 114 (1879); Ward, *Records of Big Game*, p. 60 (1896).

Eucervus macrotis, Gray, *Ann. Mag. Nat. Hist.* ser. 3, vol. xviii. p. 339 (1866), *Cat. Ruminants Brit. Mus.* p. 86 (1872), *Hand-list Ruminants Brit. Mus.* p. 157 (1873).

Otelaphus macrotis, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 356 (1873), lxxviii. part i. p. 303 (1879).

Dorcelaphus hemionus, Allen, *Bull. Amer. Mus.* vol. vii. p. 257 (1895).

Characters.—Build heavier and coarser than in the common American deer. Size somewhat larger than the Virginian race of the latter, the height at the shoulder reaching to 3 feet 3 or 4 inches. Antlers with a very short sub-basal snag, beyond which the beam is directed outwards for a short distance and then curves upwards to form a regularly dichotomous



FIG. 71. —Front view of Head of Mule-Deer. From a specimen in the possession of Mr. E. S. Cameron.

fork, of which both prongs are normally nearly equal, and again divide, the normal number of points thus being five on each side. Ears very large and thickly haired; tail moderately long, terminating in a brush-like tuft of hair, naked on the under surface at the base; muzzle rather short; face-gland rather large. Metatarsal gland and tuft long and straight, occupying the whole of one side of the upper half of the outer surface of the cannon-bone, its hair nearly the same cinnamon tint as that of the leg, as is likewise that



MULE-DEER IN WINTER PELAGE.

THE UNIVERSITY OF CHICAGO

of the tarsal gland. General colour of pelage of upper-parts some shade of reddish or yellowish tawny in summer, in winter dark brownish or rufous gray, more or less speckled with whitish, darkest on the withers; forehead usually with a dark brown patch, extending nearly to the eyes, and commonly known as the "horseshoe," a brown patch on each side of the nose, rest of face and throat white; inner side of buttocks and legs, abdomen, and most of inner surface of ears white or whitish, as is also the tail, with the exception of its terminal tuft, which is black; rest of under-parts blackish brown. The front border of the ear is black. On the first assumption of the winter coat the colour, according to Mr. Caton, becomes for a short time almost black.

The large hairy ears, the elongated metatarsal gland, the tufted tail, with its lower surface naked at the base, and the shape of the antlers, form the leading characteristics of this well-marked species.

Distribution.—The greater part of North America westward of the Missouri River, extending, according to Mr. Caton, over about thirty degrees of latitude, from Cape St. Lucas, at the southern extremity of California in the south, into British Columbia in the north. The range thus includes suitable localities in parts of Dakota, Nebraska, Kansas, Texas, Colorado, Wyoming, Montana, Idaho, Nevada, California, Oregon, Washington, British Columbia, and probably some other States.

Mr. Caton writes that "the original range of this deer has not been very much restricted since it was first discovered, although it has been driven back from the Missouri River, and has deserted other limited localities, where the miners or settlers have driven it away. . . . West of the Rocky Mountains it is met with almost everywhere, though much more abundantly in some places than in others. In the coast range of Northern California it is almost entirely replaced by the Columbian black-tailed deer, while in the coast range of Southern California scarcely any other deer is met with. . . . In all of Oregon, in Washington Territory, and in British Columbia, this deer is met with, though much less abundant than the true black-tailed deer, or even the Virginian deer."

Mr. J. Turner-Turner¹ has published a map showing the present distribution of the mule-deer in British Columbia, from which it appears that the range is now limited to a narrow strip of country running to the north-

¹ *Three Years' Hunting and Trapping* (1888).

west of Fort George, a second running southwards from that point for some distance down the Fraser River and then to the eastward of the same, and a third patch lying some way to the west of the lower part of that river.

Antlers.—Mr. E. S. Cameron has supplied the following information with regard to the cranial appendages :—"The first antlers are usually forks, but I have obtained an eighteen months' old fawn with perfect spikes, and twice shot deer bearing for their first antlers a spike on one side and a fork on the other. In the second antlers the beam lengthens, but is still simply forked. In the third antlers one of the prongs, either anterior or posterior, is again forked, while the other remains simple. In the fourth antlers both prongs are forked. The sub-basal snag is not, apparently, developed until the assumption of the fifth antlers. The antlers are clean by the end of October and are shed in March."

The following dimensions of antlers belonging to this species and to the black-tailed Columbian deer are recorded by Mr. Ward :—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.	Locality.
30	$5\frac{3}{4}$?	41	17	Colorado
$28\frac{5}{8}$	$4\frac{1}{2}$	$13\frac{1}{4}$	$17\frac{3}{4}$	5-5	Wyoming
$28\frac{1}{2}$?	?	$24\frac{1}{2}$?	Colorado
$27\frac{3}{4}$	6	$15\frac{1}{4}$	$19\frac{1}{4}$	9-6	Brit. Columbia
27	$5\frac{1}{4}$	$19\frac{1}{2}$	$21\frac{5}{8}$	6-5	?
$26\frac{7}{8}$	5	?	?	35	Dakota
$26\frac{3}{4}$	$4\frac{3}{4}$	$19\frac{5}{8}$	$20\frac{1}{8}$	5-5	Wyoming
$26\frac{1}{2}$	$5\frac{3}{4}$?	$17\frac{1}{2}$	12	?
$26\frac{1}{3}$	$4\frac{1}{8}$	$15\frac{7}{8}$	$22\frac{7}{8}$	6-6	?
$25\frac{1}{2}$	$5\frac{1}{2}$?	$21\frac{1}{2}$	8	?
$25\frac{1}{2}$	$4\frac{3}{4}$?	?	28	Montana
$25\frac{1}{2}$	$4\frac{3}{4}$	18	$24\frac{1}{4}$	5-5	Colorado

Habits.—For the following information regarding the habits of the mule-deer, I am indebted to Mr. E. S. Cameron, who has had unusual opportunities of observing them in Montana and Dakota. These deer possess great speed, and can maintain it for a long time ; I have seen them run right away from greyhounds in a broken country. Their ordinary gait is a succession of stiff-legged bounds, which they exchange for an even gallop if wounded, or if pressed either by a greyhound or by a swift horse.

They also trot well. A mule-deer with a broken hind-leg is capable of wonderful speed downhill, and should a fore-leg be broken, a fast horse must gallop to catch it on level ground. In horizontal leaping these deer surpass all animals with which I am acquainted, and for ability to traverse a rough country there is little to choose between them and their neighbours the mountain-sheep. On the other hand, when frequenting the fenced



FIG. 72.—Oblique view of Head of Mule-Deer. (Rowland Ward, *Records of Big Game*.)

pastures of deserted ranches, for which they have a great inclination, they invariably crawl under, or squeeze through the wires instead of jumping over them. They are very similar to range-horses in their habits, and the herds, small or large, will frequent a tract of about ten miles in diameter, watering at the same place every day if left undisturbed. Like mountain-sheep, they love to lie sheltered from the wind, on the narrow ledges of the high buttes, commanding the view all round, except to windward, from

which side their noses sufficiently protect them. During the summer they associate in small bands ; a doe with several of her fawns of different years in one group, and two or three old bucks with a young buck, which acts as sentinel, in another, while the medium-sized bucks are often quite alone. At the end of October, or as soon as their antlers are clean, the bucks begin to "round up" the does ; and make no objection to the presence of two-year, and even three-year-old, male deer in the harem, for I have killed a master-buck and a three-year-old out of the same party. Although I have seen a buck with does as early as 18th of October, from the first to the 15th of November is usual for the commencement of the pairing-season, when the old bucks grunt like a fallow deer ; and I have seen a buck followed by several does walk to the edge of a "bad-land" point, and challenge repeatedly across the prairie in the still air.

The bucks do not appear to be able to keep many does, sixteen, to the best of my recollection, being the most I have seen with one buck, while eleven or twelve is a more common number ; nor do they appear to suffer much from the effect of the rut, as immediately after they are more wary and run greater distances than before. The duration of the pairing-season is about six weeks. They now collect into small parties, from two to a dozen, but the idea that they retire singly into solitude to shed their antlers is, in my opinion, a fallacy.

Although the bucks are pugnacious among themselves during the pairing-season, I have never known of an injury being inflicted by an antler-thrust, but have twice come across cases of blindness from cataract. The old bucks will stand at bay when severely wounded, but never in my experience act upon the aggressive towards a man on foot, so long as he keeps a few yards off, although a buck will wheel and charge a horseman who is pressing it too closely. The does, which drop their spotted fawns in May, and generally give birth to twins, are always watchful ; and when a party of deer are resting, the long ears of the recumbent does move backwards and forwards with irregular jerks, one of them constituting herself a sentinel, and rising at intervals to listen on all sides before again lying down. Mule-deer feed chiefly on grass, and keep their condition in spite of the severe winters, as they can paw away the snow like horses, supplementing their diet with cedar and buffalo berries, which are very plentiful. Should the depth of snow be excessive, as a last resource they

eat the tops of the sage-brush. They only venture on to the prairie at night to enjoy the superior grass there, but in a wooded or broken country they may be seen feeding at any hour of the day, more especially if the night has been stormy. Although their true home is in the "bad-lands," they seek shelter from snowstorms in woods, leaving them again as soon as the sky clears, and I have found the big pine- and cedar-thickets a certain haunt in wintry weather. These they will not leave if they discover that they are being followed, but circle round and round, returning to the place from which they started and traversing impenetrable brakes through which a horse cannot be led. At such times they chiefly trot, and the noise of their feet can be heard in the frozen snow like the ticking of a clock. I never heard of an unwounded mule-deer being killed by wolves, which, in my opinion could not catch it. A wounded deer, however, is at once devoured by them. On the other hand, I know several instances of these deer being killed by pumas.

When I first went to Montana, in 1889, mule-deer were so exceedingly plentiful as to excite surprise, but now, 1897, their numbers have been much reduced by the professional hunters, who shoot them down in hundreds, and evade the laws by shipping the hind-quarters out of the State under fictitious names, calling them poultry, mutton, etc., and leaving the fore-quarters for the wolves. This mercenary chase of mule-deer is only pursued during the pairing-season, because the meat would not keep before that period.

Several American-bred specimens of mule-deer have been from time to time exhibited in the London Zoological Gardens, and from these a large number of fawns have been produced in the menagerie. Some time ago there was a pair at Woburn Abbey, but they survived only for a short period.

a. TYPICAL RACE—MAZAMA HEMIONUS TYPICA

Cervus macrotis montanus, Caton, *Antelope and Deer of America*, 2nd ed. p. 94 (1881).

Characters.—General coloration that described above, of a full dark tint; tail yellowish white, with a jet-black terminal tuft.

Distribution.—The greater part of the area of the species, exclusive of that occupied by the other sub-species.

b. CALIFORNIAN RACE—*MAZAMA HEMIONUS CALIFORNICA*

Cariacus macrotis californicus, Caton, *Amer. Naturalist*, vol. x. p. 464 (1876), xix. p. 811 (1885).

Characters.—Ears still larger than in the typical race, and the colour of the pelage, although variable, not unfrequently brighter; a brown or tawny line on the upper surface of the tail connecting the dark of the upper-parts with the black tail-tip. After remarking that the tail is slightly longer than in the typical race, Mr. Caton has the following observations on this form:—"Its great distinction is in the colour of the tail, which alone is sufficient to declare it a very distinct variety, where other indicia, which are plainly declared, wanting. It has the naked portion on the under side the same as in the eastern variety, but instead of all being white above the black tuft at the end, a stripe of the colour of the back above the tail, with which it unites, runs down the upper side of the tail and unites with the terminal black tuft. On some specimens this brown stripe grows darker towards the lower end, and on some the tawny brown shade of the stripe invades the black tuft."

Distribution.—California south of San Francisco, but the extreme southern limit not determined.

c. LA PAZ RACE—*MAZAMA HEMIONUS PENINSULÆ*

Characters.—Much smaller than the last, and still more brightly coloured, with the antlers in the form of simple spikes and a basal snag. The winter pelage on the upper-parts is dark speckled iron gray, with an irregular black band along the middle of the back, expanding towards the hind-quarters, and continued on to the upper surface of the tail, where it may be connected by a narrow line with the black extremity, or may be separated by a broad ring of pale straw-coloured hair. The legs are bright chestnut, and there is a patch of the same colour on the flanks, separating the dark speckled gray of the back from the uniform blackish brown of the under-parts.

This race is named on several skins of females and sub-adult males recently acquired by the British Museum. Similar specimens from Cape

St. Lucas are noticed by Mr. Caton,¹ who refers especially to the simple form of the antlers, which are of a degraded type. Several of the other mammals from the same district are distinguished from their representatives to the northwards by their brighter coloration.

Distribution.—The extreme south of the Californian Peninsula.

d. WESTERN DESERT RACE—MAZAMA HEMIONUS EREMICUS

Dorcelaphus hemionus eremicus, Mearns, *Proc. U. S. Mus.* vol. xx. p. 470 (1897).

Characters.—The following is the original description of this subspecies:—The mule-deer of the Western Desert Tract, like all mammals of that region, is remarkable for the extreme pallor of its coloration. An adult male, taken in December 1895, in the Sierra Seri, near the Gulf of California, in the most arid portion of Sonora, Mexico, is in full winter pelage. The coat is short and glossy. Coloration above very pale drab-gray, with a dark vertebral area, which begins as a narrow median stripe on the upper side of the neck, broadens and becomes fainter on the back, forms a blackish spot at the root of the tail, down which it descends for a short distance. The buttocks, inguinal, and abdominal regions, and the middle of the tail all around are white. The axillæ and hollows of the thighs are entirely naked. The edges of the buttocks, posterior surface of limbs, and the feet are washed with pale, muddy cinnamon. The chest is light sooty drab. Tail with a heavy brush or short switch of black hair at the end, the middle portion being white all around, the dusky colour running down a short distance on the upper side from the blackish spot at its base. While the general effect is to produce a pale drab-gray colouring of the upper surface, there is the usual pepper-and-salt commingling of colours, produced by light and dark annulation of the hairs, those in the vertebral area being pointed with brownish black. It appears to be a larger animal than the mule-deer of the Eastern Desert Tract, and, unless the specimens are abnormal, its antlers are heavier and more divergent, being remarkable for the great length of the beam before forking. In a youngish specimen from the Sonoyta Valley they are doubly dichotomous throughout, having four points, besides a basal snag, on each. Another

¹ *Amer. Naturalist*, vol. x. p. 468 (1876).

pair belonged to a fully adult animal, killed at Black Butte, on the Colorado Desert near the mud-geysers, Lower California. This was one of six killed during the winter of 1893-94. The beam is unusually stout; the antlers being doubly dichotomous.

Distribution.—Western Desert Tract of the Mexican border of the United States.

5. THE BLACK-TAILED DEER—*MAZAMA COLUMBIANA*

Cervus macrotis, var. *columbianus*, Richardson, *Fauna Bor. Amer.* p. 257 (1829).

Cervus lewisii, Peale, *Mamm. U. S. Explor. Exped.* p. 39 (1848).

Cervus richardsonii, Audubon and Bachman, *Quadrupeds of N. America*, vol. ii. p. 211 (1853).

Cariacus punctulatus, Gray, *Proc. Zool. Soc.* 1850, p. 239, *Cat. Ungulata Brit. Mus.* p. 232 (1852).

Cervus columbianus, Baird, *N. Amer. Mammals*, p. 659 (1857); Caton, *Antelope and Deer of America*, p. 96 (1877).

Eucervus columbianus, Gray, *Ann. Mag. Nat. Hist.* ser. 3, vol. xviii. p. 388 (1866), *Cat. Ruminants Brit. Mus.* p. 86 (1872), *Hand-list Ruminants Brit. Mus.* p. 157 (1873).

Otelaphus richardsonii, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 357 (1873), lxxviii. part i. p. 308 (1879).

Reduncina punctulata, Fitzinger, *op. cit.* lxxviii. part i. p. 357 (1873).

Cariacus columbianus, Brooke, *Proc. Zool. Soc.* 1878, p. 921.

Otelaphus punctulatus, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 307 (1879).

Cariacus macrotis columbianus, Ward, *Records of Big Game*, p. 60 (1896).

Dorcelaphus columbianus, Mearns, *Proc. U. S. Mus.* vol. xx. p. 468 (1897).

Characters.—Smaller than the mule-deer, with relatively shorter ears and finer hair, especially distinguished by the shorter metatarsal gland and tuft, which occupy a considerable portion of the upper half of the segment of the cannon-bone, and also by the greater portion of the tail being black, with only the basal third of the lower surface white. General colour of pelage of upper-parts in winter speckled tawny brownish gray, the individual hairs being dark brown for the greater part of their length, but

near the extremity ringed with yellowish brown, and terminating in a black tip; hinder portion of under-parts and region of base of tail, as well as upper throat and chin, white; face gray, darker on the forehead; legs dark cinnamon, without any admixture of white hairs; tarsal and metatarsal tufts only a shade lighter than the adjacent portions of the leg; no naked portion of gland visible in the elongated metatarsal tuft. In summer the general colour of the upper-parts reddish yellow. Face-gland rather small. Antlers of the general type of those of the mule-deer, but relatively smaller.

The distinctive features of this species are the entirely black tail-tip, and the medium length of the metatarsal gland and tuft, which are situated entirely above the middle of the cannon-bone. Mr. Caton states that the gland is intermediate between that of the mule-deer and that of the Virginian, and figures a specimen in which the naked portion is about an inch and a half in length. But in a pair of this species in captivity at Woburn Abbey in the summer of 1897, where they survived only a very short time, the gland and its tuft were longer, and much more like those of the mule-deer.

Distribution.—Western North America, from British Columbia, through Washington and Oregon west of the Cascade Mountains, to California; the typical locality being the mouth of the Columbia River, in Washington, where it was discovered by Lewis and Clarke in 1805. It also occurs in the coast districts of Vancouver Island. Mr. Caton observes that “the most extraordinary fact in connection with this deer is the extremely narrow limits of its range, which is within a narrow belt along the Pacific coast of America, in the temperate zone. In many parts of this district it is the most abundant deer to be met with. Why it has never wandered beyond these bounds, it is hard to say. It has never even reached the base of the Rocky Mountains, except possibly in the extreme northern part of its range. The mountain barriers could not restrain it; for it ranges high up on the Sierra Nevada, and is found on the eastern slope of that range. If the deserts at the south would deter it from an eastern migration, the valleys of the streams heading in the Rocky Mountains, and emptying into the Columbia River, invited it to follow their banks, and would have led it to the summit of the range, and to practicable passes.” A map of the distribution of this species in British Columbia is given in Mr. J. Turner-Turner’s *Three Years’ Hunting and Trapping in America and the Great North-West*.

Habits.—In its general mode of life the black-tail is in some respect unlike the mule-deer, although it resembles the latter in its bounding gait when frightened. Such a fatiguing pace can, however, be maintained only for a comparatively short distance, and the deer consequently soon become blown when they start off in this manner. When starting without being frightened, they run in a more ordinary way, and are then able to hold out for a much longer time, as is also the case with the mule-deer. Unlike the latter, the present species is a forest-loving animal, frequenting the dense woods of conifers bordering the Pacific coast, whose deep shade affords ample concealment. In the less disturbed districts these deer even venture down to the sea-coast, where they feed upon the seaweed cast on the beach ; and in their journeys to and fro not a few fall victims to prowling Indians. Like the common deer, this species takes readily to the water, and may often be seen crossing a river or lake. Although spending a large portion of the year in the neighbourhood of swamps, in the pairing-season, which takes place in October, the old stags often resort to higher ground. The fawns are usually born in May, their number being generally two, although triplets have been recorded. They are more fully spotted than those of the mule-deer, the spots themselves being more sharply defined, and arranged in more definite longitudinal lines. In these respects the fawns are more like those of the Virginian deer.

Although some of the adults kept by him in confinement throve fairly well, Mr. Caton, in the first edition of his book, states that he was never able to rear a fawn. He thinks that under more favourable circumstances the fawns might survive for a year or two, but he doubts the probability of their propagating if brought direct from their native haunts to an unsuitable climate. No examples of this species have hitherto been exhibited in the London Zoological Gardens.

INCERTÆ SEDIS

1. *Mazama spinosa*

Cervus spinosus, Gervais and Gay, *Ann. Sci. Nat.* ser. 3, p. 93 (1846); Fitzinger, *SB. Ak. Wien*, vol. lxxix. part i. p. 68 (1879); Gray, *Cat. Ruminants Brit. Mus.* p. 84 (1872), as synonym of *mexicanus*.

Cariacus (?) *spinosus*, Gray, *Cat. Ungulata Brit. Mus.* p. 236 (1852).

Founded on a single immature antler from Cayenne, now in the Paris Museum and very probably referable to *M. virginiana savannarum*.

2. *Mazama similis*

Cervus affinis, Pucheran, *C. R. Ac. Paris*, vol. xxix. p. 777 (1849), *nec* Hodgson, 1841.

Cervus similis, Pucheran, *Arch. Mus. Paris*, vol. vi. p. 357 (1852).

Reduncina similis, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 357 (1873), lxxviii. part i. p. 321, lxxix. part i. p. 62 (1879).

Cariacus similis, Brooke, *Proc. Zool. Soc.* 1878, p. 920.

Founded on a male specimen in the Paris Museum, of which the exact locality is unknown, but which probably came from the Southern United States. Its general coloration is very similar to the typical race of the common American deer in summer pelage, but the upper half of the tarsal tuft is rusty red, and only the lower half white.

3. *Mazama leptocephala*

Cariacus leptocephalus, Gray, *Cat. Ruminants Brit. Mus.* p. 85 (1872), *Hand-list Ruminants Brit. Mus.* p. 157, plate xxxvii (1873).

Founded on an immature male skull in the British Museum (No. 52. 12. 26. 160), reputed to have come from South America. It is evidently of the mule-deer type, and is probably of North American origin.

4. *Mazama pusilla*

Eucervus pusilla, Gray, *Hand-list Ruminants Brit. Mus.* p. 157 (1873).

Founded on an immature male skull from North America in the British Museum (No. 68. 2. 13. 2), probably belonging to the mule-deer group. The antlers are unbranched. Description apparently insufficient.

5. *Mazama* sp.

Cervus brachyceros, Philippi, *An. Mus. Chile*, 1895 ; ¹ *nec* Gervais and Ameghino, 1880.

Cariacus sp., Nehring, *SB. Ges. Nat. Berlin*, 1895, p. 12.

Founded on a Chilian specimen referred by its describer to *Xenelaphus*, but assigned by Dr. Nehring to the present sub-genus, without determination of the species.

¹ I have been unable to see copy of this volume, and therefore cannot give the page.

ii. THE GUAZU GROUP—SUB-GENUS BLASTOCEROS

Blastocerus, Sundevall, *K. Vet. Ak. Handl.* for 1844, p. 182 (1846), as a sub-genus; Gray, *Proc. Zool. Soc.* 1850, p. 237, *Cat. Ungulata Brit. Mus.* p. 223 (1852), *Cat. Ruminants Brit. Mus.* p. 87 (1872); Brooke, *Proc. Zool. Soc.* 1878, p. 922; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 49 (1881).

Blastoceros, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 358 (1873).

Paraceros, Ameghino, *Mamm. Foss. Répub. Argent.* p. 605 (1889); see Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 80 (1893).

Antifer, Ameghino, *op. cit.* p. 610 (1889); see Lydekker, *op. cit.* p. 81 (1893).

Epieuryceros, Ameghino, *op. cit.* p. 613 (1889); see Lydekker, *op. cit.* p. 81 (1893).

Oxotoceros, Ameghino, *Rev. Argent. Hist. Nat.* vol. i. p. 243 (1891), to replace *Blastocerus*, Sundevall, on account of being preoccupied by *Blastocera*, Gerstein, 1856, which is not the case.

Characters.—Antlers large and complex, without a sub-basal snag, forking in a regularly dichotomous manner, with the upper, or posterior prong more or less exceeding the lower, or anterior one in size. Metatarsal gland and tuft absent. Tail short. Face moderately long; face-gland well developed, and the gland-pit in the skull rather large and deep. Upper canines generally present in adult males. Size large or rather small. Fawns uniformly coloured or spotted.

The absence of the metatarsal gland and of a sub-basal snag to the regularly dichotomous antlers are the most easily recognised features of the existing members of this small group. Extinct species occur in the Plistocene deposits of the Argentine pampas, and apparently also in the Pliocene beds of Monte Hermoso, in the same country. The occurrence of such remains in the last-mentioned deposits is of importance as indicating that the brockets are not the ancestral type of the group; the Monte Hermoso beds having been deposited soon after the union of North with South America, at which time deer of the present, or a nearly allied, type were already in existence.

Distribution.—The Neotropical region.

1. THE MARSH-DEER—MAZAMA DICHOTOMA

Cervus dichotomus, Illiger, *Abh. Ak. Berlin*, 1811, pp. 108 and 117.

Cervus paludosus, Desmarest, *Mammalogie*, vol. ii. p. 443 (1822); Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 480 (1879); Goeldi, *Mammiferos do Brasil*, p. 106 (1893).

Cervus palustris, Desmoulins, *Dict. Class. Hist. Nat.* vol. iii. p. 379 (1823).

Cervus (Mazama) paludosus, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 316 (1827).

Mazama paludosa, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 173 (1835).

Dorcelaphus paludosus, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Cariacus paludosus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842); Brooke, *Proc. Zool. Soc.* 1878, p. 922; Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 80 (1893); Ward, *Records of Big Game*, p. 57 (1896).

(?) *Mazama furcata*, Gray, *List Mamm. Brit. Mus.* p. 176 (1843).

Cervus (Elaphus Blastocerus) paludosus, Wagner, Schreber's *Säugethiere*, vol. iv. p. 367 (1844).

Cervus (Blastocerus) paludosus, Sundevall, *K. Vet. Ak. Handl.* for 1844, p. 182 (1846).

Blastocerus paludosus, Gray, *Proc. Zool. Soc.* 1850, p. 237, *Cat. Ungulata Brit. Mus.* p. 224 (1852), *Cat. Ruminants Brit. Mus.* p. 87 (1872), *Hand-list Ruminants Brit. Mus.* p. 157 (1873); Müller, *Zool. Garten*, vol. xxxvii. p. 49 (1896).

Blastoceros paludosus, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 359 (1873), lxxviii. part i. p. 350 (1879).

Blastoceros paludosus fossilis, Ameghino, *Mamm. Foss. Répub. Argent.* p. 608 (1891); see Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 80 (1893).

(?) *Paraceros ensenadensis*, Ameghino, *loc. cit.*; see Lydekker, *loc. cit.*

Cervus (Blastoceros) paludosus, Ihering, *Mammiferos de S. Paulo*, p. 14 (1894).

Cariacus palustris, Lydekker, *Royal Nat. Hist.* vol. ii. p. 387 (1894).

Characters. —Largest of the South American deer, the size being apparently fully equal to that of a red deer, but the build more slender. Antlers large and rugose, with both prongs of the main fork dividing more than once, and the upper prong usually somewhat larger than the lower one. Muzzle bluntly pointed; ears large, and filled internally with woolly white hair; tail bushy. Hair long and coarse, without radiating whorls on the back and neck. General colour of upper-parts bright rufous chestnut in



FIG. 73.—Side view of Antlers of Marsh-Deer. From a specimen in the British Museum.

summer, in winter brownish red, becoming lighter on the flanks, neck, and chest; legs black from the knee and hock downwards, and the tarsal tuft also black; abdomen, inside of thighs, throat, chin, and inside and base of back of ears white or yellowish white; a whitish line above, or a ring round the eyes, most marked in the hinds; a black band on the muzzle and upper lip, joining a median dark streak on the nose, and black markings on the under lip; tail yellowish rusty red above and black beneath. In immature hinds the limbs are less black, showing fawn on the sides

below the hock and knee, in advance of which the extremities are white, and the black streak on the nose is wanting. The young are not spotted.

This deer has never been exhibited in the London Zoological Gardens, although a specimen was living in the menagerie at Berlin in 1896. I have never seen a fully adult example, and the species is best known to me



FIG. 74.—Young Marsh-Deer. From a photograph by the Duchess of Bedford.

by an immature mounted specimen at Woburn Abbey, and the equally young examples forming the subject of Fig. 74. It is somewhat curious to note that the coloration of this species is almost identical with that of the so-called maned wolf (*Canis jubatus*) of the same districts.

Although ten is the normal number of their points, the antlers of this species are liable to “sport” in an extraordinary degree; specimens as complex as the one represented in Fig. 75 being by no means uncommon. The following dimensions of antlers are taken from Mr. Rowland Ward’s *Records of Big Game*:—

Length along Outer Curve.	Basal Circumference.	Tip to Tip.	Widest inside.	Number of Points.
$24\frac{1}{2}$	5	16	18	5-5
$23\frac{1}{2}$	$6\frac{7}{8}$	26	25	5-5
$23\frac{3}{8}$	$5\frac{1}{8}$	$15\frac{3}{4}$	$16\frac{1}{4}$	4-5
$23\frac{1}{4}$	6	?	$19\frac{1}{2}$	12
$22\frac{5}{8}$	$6\frac{1}{4}$	20	$20\frac{1}{2}$	5-5
$22\frac{3}{8}$	$5\frac{1}{2}$	25	?	28
$21\frac{1}{2}$	5	$12\frac{3}{4}$	16	5-5

Distribution.—In suitable localities throughout Brazil, and perhaps part of Guiana, through Paraguay, Entre Rios and Uruguay to the Chaco, or



FIG. 75.—Malformed Antlers of Marsh-Deer. (Rowland Ward, *Records of Big Game.*)

wooded interior districts of Argentina. According to Admiral Kennedy, the species is, however, now very rare in Uruguay and Entre Rios. It is abundant in the neighbourhood of Matto-Grosso, Brazil. Its fossilised remains occur in the superficial deposits of the Argentine pampas; the antlers from these formations described under the name of *Paraceros* apparently belonging either to the present or a closely allied form.

With regard to the adoption of the name *dichotoma*, instead of the usually accepted *paludosa*, it may be mentioned that although Illiger gives no description of the animal he designates by the former name, yet as he refers to the gouzoupoucou of Azara, which is the present species, his name is entitled to stand.

Habits.—According to Dr. Goeldi, the veado galheiro inhabits the thick jungles on the borders of the great Brazilian rivers, where it goes about in small parties of from three to five individuals. During the day it lies hidden in the rank vegetation, issuing forth to feed about sunset, and remaining abroad till after sunrise; its food consisting of reeds and various other aquatic plants. Its sense of smell and hearing being very acute, and its flight rapid, this deer is difficult to stalk. The hind produces a single fawn annually, which after four or five days is able to run by the side of its dam. If taken young it can be easily tamed, but its constitution is very delicate. Although its flesh is only eaten where other food cannot be obtained, its skin is largely used for leather by the natives.

2. THE PAMPAS DEER—MAZAMA BEZOARTICA

Cervus bezoarticus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 67 (1766).

Cervus campestris, F. Cuvier, *Dict. Sci. Nat.* vol. vii. p. 484 (1817); Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 463 (1879); Goeldi, *Mammiferos do Brasil*, p. 107 (1893).

Cervus leucogaster, Schreber, *Säugethiere*, vol. v. p. 1127 (1817).

Cervus (Mazama) campestris, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 136, v. p. 317 (1827).

Cervus azaræ, Wiegmann, *Isis*, 1833, p. 954.¹

Mazama campestris, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 174 (1835); Gray, *List Mamm. Brit. Mus.* p. 176 (1843).

Dorcelaphus campestris, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Cariacus campestris, Lesson, *Nouv. Table Hist. Nat.* p. 173 (1842); Brooke, *Proc. Zool. Soc.* 1878, p. 923; Aplin, *ibid.* 1894, p. 313; Ward, *Records of Big Game*, p. 59 (1896).

Cervus (Elaphus Blastocerus) campestris, Wagner, Schreber's *Säugethiere*, vol. iv. p. 369 (1844).

Cervus (Elaphus Blastocerus) comosus, Wagner, *op. cit.* p. 368 (1844).

Furcifer campestris, Gray, *Knowsley Menagerie*, p. 68 (1850).

Blastocerus campestris, Gray, *Proc. Zool. Soc.* 1850, p. 237, *Cat. Ungulata*

¹ The original description is stated to be in a work entitled *Abbildungen merkwürd. Säugethiere* (p. 69), very few copies of which appear to have been published.

Brit. Mus. p. 224 (1852), *Cat. Ruminants Brit. Mus.* p. 87 (1872), *Hand-list Ruminants Brit. Mus.* p. 158 (1873).

Blastoceros campestris, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 359 (1873), lxxviii. part i. p. 364 (1879).

Blastoceros comosus, Fitzinger, *op. cit.* lxxviii. p. 359 (1873), lxxviii. p. 356 (1879).

Blastoceros azaræ, Fitzinger, *op. cit.* lxxviii. p. 359 (1879).

Cervus comosus, Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 465 (1879).

Ozotoceros campestris, Ameghino, *Rev. Arg. Hist. Nat.* vol. i. p. 243 (1891).

Cervus (Blastoceros) campestris, Ihering, *Mammiferos de S. Paulo*, p. 15 (1894).

Plate XXII

Characters.—Much smaller than the last, and of the approximate size of the European roe, although more delicately and slenderly built. Antlers of moderate size, with the lower or front prong of the main fork simple, and the upper or posterior prong divided, and thus much the more complex, the usual number of tines being three. Muzzle rather pointed; ears moderately large and filled with white hair; tail moderately bushy. Hair short and smooth, that of the middle of the back forming a whorl, and a second whorl at the base of the neck, so that the fur of the withers is directed forwards.¹ General colour of upper-parts and limbs light reddish brown, with the individual hairs of the back light gray at the base, then darker gray, followed by a ring of reddish brown, and the tip black; face darker, occasionally a black patch on the crown of the head, extending backwards as a line to the level of the ears; tarsal tuft, a patch at the base of the back of the ears, a ring round the pedicles of antlers, another round each eye, the lips, throat, chest, under-parts, front and inner side of thighs, of buttocks, and of upper part of fore-legs, whitish; flanks, outer side of limbs, and middle of throat lighter than back; tail dark blackish brown above and white below. Upper canines generally present in the male. Very young fawns lighter coloured, with a row of white spots on each side of the back, and a second row running from the shoulder to the thigh.

¹ A similar peculiarity occurs in *Cervus albirostris*.



PAMPAS DEER.

NATIONAL MUSEUM MELBOURNE

The above description is taken from Paraguayan and Argentine examples,—the *Blastoceros azaræ* of Fitzinger. In the true Brazilian *campestris*, which the latter writer regards as a distinct species, the colour tends more to yellowish gray, and upper canines are stated to be always wanting. These, however, are occasionally not developed in males from Argentina and Paraguay. Fitzinger states that the Brazilian form lacks the strong scent of the Argentine race, but this is denied by Dr. Goeldi. In any case, the difference between the northern and southern races is not of more than sub-specific importance. A young specimen from Santa Fé, in the chaco districts of Argentina, living at Woburn Abbey in 1897, and forming the subject of Fig. 76, had a very strongly marked black patch and line on the crown of the head, and the white of the buttocks bordered by a thin black line; the base of the upper surface of the tail being also black, and the general colour brown fawn. Such slight differences can, however, scarcely be regarded as indicating even a distinct sub-species.

The Brazilian *Cervus comosus* was regarded by Fitzinger as a smaller and longer-haired form allied to the marsh-deer; but Burmeister has shown that it was founded on an old male of the present species, in which, as is commonly the case in aged examples of that sex, the hairs on the buttocks, tail, and under-parts had become greatly elongated.

A fraction over $14\frac{1}{2}$ inches is the length of the longest pair of antlers of this species recorded in Mr. Rowland Ward's book; the specimen being in the British Museum.

Although this species is universally known by the specific name of *campestris*, there is no justification for the suppression of the Linnean *bezoartica*, which was applied to a South American deer with cylindrical, three-tined antlers; such deer being evidently the present species. It may be added that although the names *campestris* and *leucogaster* date from the same year, the former is the earlier, as it is quoted in Schreber's work, in which the latter is given for the first time.

Distribution.—The open campos of Brazil, Paraguay, and Uruguay to the pampas of Argentina and Northern Patagonia, and also extending into the chaco, or wooded country of Argentina in the neighbourhood of Santa Fé.

Habits.—The veado campeiro, as this species is called in parts of Brazil, differs from the veado galheiro by being an inhabitant of dry open plains, and also by the strong disagreeable odour emitted by bucks after their first

year. It never enters the forests and thickets of Brazil and Paraguay, but restricts itself to the open campos which extend here and there among the forest tracts, and are also the habitat of the Brazilian rhea. On the Argentine pampas the animal is found in more or less entirely open country. Formerly, when the tussocks of tall pampas-grass were dotted more or less thickly over all the plains, it had plenty of covert; but in the more settled districts it now has to live almost completely in the open, and has



FIG. 76. Young Male Pampas Deer. From a photograph by the Duchess of Bedford.

consequently become wary in the extreme. The presence of a buck, especially in the evening, may, however, often be detected by the characteristic odour which will be perceptible at the distance of a mile or so. These deer may be found either in pairs, in parties of three or four, or in small herds, but the old bucks are often or always solitary for the greater part of the year. Their times of feeding are much the same as those of the marsh-deer, the animals remaining concealed under tussocks of pampas-grass, or in such other shelter as they can find, and issuing forth

to graze in the evening. Their alarm-cry is a low, whistling bark. When a hind with her fawn is surprised by hunters, she stands stock-still until her offspring has stolen quietly away and concealed itself, after which she moves off in the opposite direction, at first slowly, and sometimes even with a limping gait, in order to draw away the hunters from the hiding-place of her young one.

In certain parts of Brazil this deer is known as the guazuti, but in Uruguay, where it has now become very scarce, it is termed gama. If taken sufficiently young, it becomes excessively tame, wandering about an estancia among the men, horses, cattle, and dogs with the most complete unconcern. The presence of strange men or dogs at once, however, causes alarm. In the domesticated state, it will eat almost any kind of vegetable food, either fresh or cooked; and, like most of the deer tribe, displays great partiality for salt. Its speed is considerable, and it requires a good horse to overtake it; by the natives it is captured either with the bolas, or, less commonly, with the lasso.

3. THE LUJAN MARSH-DEER—*MAZAMA BRACHYCEROS* (*Extinct*)

Cervus brachyceros, Gervais and Ameghino, *Mamm. Foss. Amer. Sud.* p. 126 (1880).

Cervus lujanensis, Ameghino, *Diagnosis Mam. Fos. Neu.* p. 12 (1888), *Mam. Fos. Repúb. Argent.* p. 603 (1889).

Cervus palaeoplatensis, Ameghino, *op. cit.* p. 13 (1888), and 604 (1889).

Cariacus brachyceros, Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 79 (1893).

Characters.—There are several species of extinct deer from the Plistocene deposits of Buenos Aires more or less nearly allied to the marsh-deer, but with more complicated antlers, some of which may be noticed here. In the present species the antlers are very large, with the posterior prong of the main fork greatly exceeding the anterior one in length and complexity, and thus to a great extent obscuring the dichotomous forking. In adult antlers, of which the inner view of a specimen from the left side is shown in the accompanying figure, the front or lower prong of the main fork is simply bifurcated, but the hinder prong divides into no less

than six tines, of which all but one are on the front edge. The whole antler is much flattened, and has its main fork only a short distance above the burr. It is a much more complicated type than that of the existing marsh-deer; and indicates that the symmetrically dichotomous form of the latter is a feature of no very great structural importance.

Distribution.—Argentina during the Plistocene period.

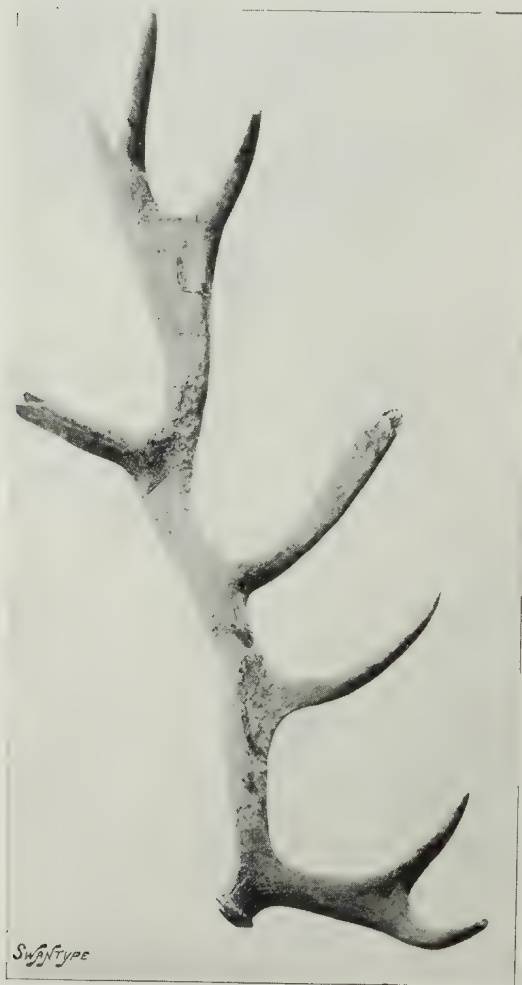


FIG. 77.—Inner view of Left Antler of Lujan Marsh-Deer. From a specimen in the La Plata Museum.

4. THE BUENOS AIRES MARSH-DEER— *MAZAMA ULTRA* (*Extinct*)

Cervus ultra, Ameghino, *Diagnosis Mam. Fos. Neu.* p. 14 (1888).

Antifer ultra, Ameghino, *Mam. Fos. Repub. Argent.* p. 610, plate xxxviii, fig. 2 (1889).

Cariacus ultra, Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 83 (1893).

Characters.—This species, which forms the type of the genus *Antifer*, and was founded upon part of a left antler from the Plistocene formation of Buenos Aires, appears to have been allied to the marsh-deer, although of considerably larger size, and with the antlers much flattened. The antler

forks in the usual dichotomous manner; the hinder tine of the terminal fork of the posterior branch of the main fork is again divided, but the front tine of the same is simple. The fragment of an antler on which the genus *Epieuryceros* was based appears to be merely the basal portion of an old antler of the present species; and if this be so, the main bifurcation took place nearer to the burr than is the case in the living marsh-deer.

Distribution.—Argentina during the Plistocene epoch.

5. AMEGHINO'S MARSH-DEER—*MAZAMA FRAGILIS* (*Extinct*)

Cervus fragilis, Ameghino, *Diagnosis Mam. Fos. Neu.* p. 11 (1888).

Paraceros fragilis, Ameghino, *Mam. Fos. Repúb. Argent.* p. 606, plate xxxviii, fig. 7 (1889).

Cariacus fragilis, Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 82, plate xxxii (1893).

Characters.—The type of this well-marked species is an imperfect left antler from the superficial deposits of the pampas of Buenos Aires. The beam is cylindrical, and the main bifurcation takes place about two inches above the burr. The anterior branch of the main fork is given off at an obtuse angle to the posterior one, and is apparently simple. The much larger posterior branch forks about five inches above the main bifurcation, and the hinder tine again divides dichotomously. The figured specimen, from which the front prong of the main fork is broken away, is one of a pair in the museum at La Plata. Both antlers show five points, and apparently indicate a species allied to the pampas deer, but having antlers of a more complex type.

Distribution. — Argentina during the Plistocene epoch.



FIG. 78.—Front view of Left Antler of Ameghino's Marsh-Deer. From a specimen in the La Plata Museum.

iii. THE GUEMAL GROUP—SUB-GENUS *XENELAPHUS*

Hippocamelus, Leuckart, *De Equo bisulco Molinæ*, p. 23 (1816).

Cervequus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842).

Furcifer, Sundevall, *K. Svenska Vet. Ak. Handl.* for 1844, p. 183 (1846), in part, as a sub-genus; Gray, *Proc. Zool. Soc.* 1850, p. 236, *Cat. Ungulata Brit. Mus.* p. 226 (1852), *Cat. Ruminants Brit. Mus.* p. 88 (1872), *Ann. Mag. Nat. Hist.* ser. 4, vol. xiii. p. 331 (1874); Brooke, *Proc. Zool. Soc.* 1878, p. 923; Rüttimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 49 (1881); *nec* Fitzinger, 1843.

Xenelaphus, Gray, *Proc. Zool. Soc.* 1869, p. 498, *Cat. Ruminants Brit. Mus.* p. 89 (1872), *Ann. Mag. Nat. Hist.* ser. 4, vol. xiii. p. 331 (1874).

Anomalocera, Gray, *Scientific Opinion*, 1869, p. 384; Philippi, *Wiegmann's Archiv*, 1870, p. 46; *nec* Templer, 1837.

Huamela, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xi. p. 217 (1873); *Hand-list Ruminants Brit. Mus.* p. 159 (1873).

Creagoceros, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 358 (1873), lxxviii. part i. p. 369 (1879).

Characters.—Antlers small and simple, forming a single dichotomous fork, of which the front prong is the smaller, and curves upwards and backwards towards the hinder one. Metatarsal gland and tuft absent. Tail short and rather bushy. Face moderately long; face-gland large and exposed, and the gland-pit in the skull deep and triangular, but not very large. Upper canines present in both sexes, although not projecting beyond the lips. Fur very coarse and brittle. Size medium. Fawns uniformly coloured.

This sub-genus is well distinguished by the simply forked antlers, the coarse brittle hair, and the absence of the metatarsal gland. The absence of the latter, and the uniform coloration at all seasons and all ages are evidently specialised features; and it accordingly seems that the simple form of the antlers is due to degradation, and cannot therefore be regarded as indicating the ancestral type from which the more complex forms of *Mazama* antlers have been evolved.

The synonymy of the sub-genus and its two existing species is singularly involved and complex; the clearing of the web of confusion being mainly due to Mr. Sclater. As noted below, the early names *Hippocamelus* and *Cervequus* are rejected on account of their inappropriate nature. The name *Furcifer* being preoccupied, and also apparently first applied to the pampas deer, *Xenelaphus* and *Anomalocera* come next, the second of these being likewise barred by an earlier use. Although *Xenelaphus* was originally

NATIONAL MUSEUM OF NEWBORNE



PERUVIAN GUEMAL.

applied to a specimen with abnormal antlers, this affords no reason for its rejection, and Fitzinger's creation of *Creagoceros* is therefore quite superfluous.

Distribution.—Western and southern portions of the Neotropical region.

1. THE PERUVIAN GUEMAL—MAZAMA ANTISIENSIS

Cervus antisiensis, D'Orbigny, *Arch. Mus. Paris*, vol. iii. p. 91 (1834) ; Sclater, *Proc. Zool. Soc.* 1875, p. 46 ; Matschie, *SB. Ges. nat. Berlin*, 1894, p. 63.

Cervus (Elaphus Furcifer) antisiensis, Wagner, Schreber's *Säugethiere*, vol. iv. p. 384 (1844).

Cervus (Furcifer) antisiensis, Sundevall, *K. Vet. Ak. Handl.* for 1844, p. 183 (1846).

Anomalocera huamel, Gray, *Scientific Opinion*, 1869, p. 384.

Xenelaphus huamel, Gray, *Proc. Zool. Soc.* 1869, p. 497.

Xenelaphus leucotis, Gray, *Cat. Ruminants Brit. Mus.* p. 89 (1872).

Xenelaphus anomalocera, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. x. p. 445 (1872).

Xenelaphus chilensis, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xii. p. 61 (1873), *Hand-list Ruminants Brit. Mus.* p. 159 (1873).

Creagoceros antisiensis, Fitzinger, *SB. Ak. Berlin*, vol. lxviii. part i. p. 358 (1873) ; lxxviii. part i. p. 369 (1879).

Furcifer chilensis, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xiii. p. 332 (1874).

Cariacus antisiensis, Brooke, *Proc. Zool. Soc.* 1878, p. 924 ; Schäff, *Zool. Garten*, vol. xxxi. p. 226 (1890).

Furcifer antisiensis, Nehring, *SB. Ges. nat. Berlin*, 1895, p. 9.

Plate XXIII

Characters.—Size somewhat less than that of the Virginian deer. Build rather stout and heavy ; ears long, narrow, and sharply pointed, well haired on both sides, and the hair at the base on both surfaces elongated ; hair short, thick, rough, and brittle, longest between the ears, on the forehead, and on the tail. Pelage of upper-parts and outer side of limbs coloured a mixture of brown and yellowish white, so as to give a general

speckled yellowish gray-brown appearance ; the flanks, head, and forehead speckled brownish white ; the individual hairs are whitish at the root, then ringed with brownish, followed by yellowish white, and terminating in a black tip, but on the sides of the head and forehead the tips are white. A dark median line running down the forehead to the tip of the nose ; under surface of lower jaw, throat, part of fore-neck, lower neck, hinder portion of abdomen, and inner sides of buttocks and limbs white ; chest and underparts uniform brownish, darker than the back ; lower part of limbs yellowish gray-brown externally ; tail with a narrow brown and white streak along the middle of the terminal portion of the upper surface, at the base, sides, lower surface, and tip white ; ears grayish-brown externally, with a grayish-white heart-shaped spot at the base. Tarsal tuft dark blackish brown. Female smaller and darker than the male. In the specimen shown in plate xxiii the under surface of the tail is as described above, but in a second skin in the Museum it is chestnut-brown.

Distribution.—Andes of Peru, Ecuador, Bolivia, and Northern Chili, usually at heights of between 14,000 and 16,000 feet above the sea-level, but probably ranging down to 11,000 feet. In Ecuador abundant on Chimborazo, Pechincha, and Cotopaxi.

2. THE CHILIAN GUEMAL—MAZAMA BISULCA

Equus bisulcus, Molina, *Saggio Storia Nat. Chili*, p. 320 (1782).

Hippocamelus dubius, Leuckart, *De Equo bisulco Molinae*, p. 24 (1816), *Isis*, 1825, p. 362.

Auchenia huamel, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 764 (1827).

Cervequus andicus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842).

Cervus chilensis, Gay and Gervais, *Ann. Sci. Nat.* 1846, p. 91 ; Sclater, *Proc. Zool. Soc.* 1875, p. 45 ; Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 462 (1879).

Capreolus leucotis, Gray, *Proc. Zool. Soc.* 1849, p. 64.

Furcifer huamel, Gray, *Proc. Zool. Soc.* 1850, p. 236, *Cat. Ungulata Brit. Mus.* p. 227 (1852).

Furcifer antisiensis, Gray, *Cat. Ungulata Brit. Mus.* p. 226 (1852), *Cat. Ruminants Brit. Mus.* p. 88 (1872).

Huamela leucotis, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xi. p. 219 (1873), *Hand-list Ruminants Brit. Mus.* p. 160 (1873).

Creagoceros chilensis, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 358 (1873), lxxviii. part i. p. 372 (1879).

Cariacus chilensis, Brooke, *Proc. Zool. Soc.* 1878, p. 923.

Furcifer chilensis, Sclater, *List Anim. Zool. Gardens*, p. 178 (1883); Nehring, *SB. Ges. nat. Berlin*, 1895, p. 12.

Characters.—Nearly allied to the last, but of smaller size, and distinguished by the following details of form and coloration. Antlers stouter, with the front prong more decidedly shorter than the hinder one, and the fork occurring at a considerable distance above the burr, instead of close to it. Fore part of face relatively deeper, with a distinctly convex profile; eyes placed wider apart. No dark line from the forehead to the nose; throat and fore-neck yellowish brown like the rest of the neck; only a small portion of the inner surface of the thigh and upper part of the fore-leg white, the remainder of the limbs being yellowish brown.

Distribution.—The Andes of Southern Chili and the whole of Patagonia; the animal being far more abundant in the southern than in the northern portion of its range.

The history of this species is somewhat remarkable. Ancient travellers in Chili brought reports of a cloven-hoofed animal known to the natives as guemal, or huemal. This animal Molina regarded as a horse, to which he gave the name *Equus bisulcus*; although his description is very vague, the specific name is adopted. Leuckart renamed it *Hippocamelus dubius*, both names being objectionable. Hamilton Smith regarded it as a llama, under the name of *Auchenia huamel*. Lesson's generic name of *Cervequus* is nearly as objectionable as *Hippocamelus*.¹

This deer is an inhabitant of the mountain-valleys of the Cordilleras in situations where dense forests afford it a suitable habitat; during the winter, however, it descends to the plains, but never wanders any distance from the foot of the mountains. In Western Patagonia it is by no means uncommon; and it is there hunted by the Indians, who call it guamul, guemul, or huamel, and bring down the skins to Carmen and Bahia Blanca on the Atlantic sea-board.

¹ If this name is adopted, it antedates *Mazama*, and therefore will have to stand for all the American deer, if they are included in one genus.

3. THE PLISTOCENE GUEMAL—MAZAMA SENELITICA (*Extinct*)

Cervus seneliticus, Ameghino, *Diagnosis Mam. Fos. Nuev.* p. 14 (1888).

Furcifer seneliticus, Ameghino, *Mam. Fos. Repúb. Argent.* p. 612, plate xxxix, fig. 4 (1889).

(?) *Furcifer sulcatus*, Ameghino, *op. cit.* p. 611, plate xxxix, fig. 3 (1889).

Cariacus seneliticus, Lydekker, *An. Mus. La Plata—Pal. Argent.* vol. ii. p. 83 (1893).

Characters.—Nearly allied to the existing representatives of the group, but with larger antlers. The species was founded on a skull showing the simple anterior branch of the antlers, which curves upwards and forwards, starting at right angles to the posterior branch, which is broken away on both sides. The left frontlet and antler forming the type of *F. sulcatus* does not appear to be specifically distinct.

Remains of one or other of the existing species occur in the superficial deposits of Ecuador.

Distribution.—Argentina during the Plistocene epoch.

IV. THE TYPICAL, OR BROCKET GROUP—SUB-GENUS MAZAMA

Mazama, Rafinesque, *Amer. Month. Mag.* vol. i. p. 44 (1817); Merriam, *Science*, ser. 2, vol. i. p. 208 (1895).

Subulo, H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 318 (1827), as a sub-genus, nec *Subula*, Schumacher, 1817; Fitzinger, *SB. Ak. Wien*, vol. lxxix. part i. p. 7 (1879).

Passalites, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Subula, Lesson, *Nouv. Tabl. Hist. Nat.* p. 174 (1842), nec Schumacher, 1817.

Coassus, Gray, *List Mamm. Brit. Mus.* p. 174 (1843), *Proc. Zool. Soc.* 1850, p. 240, *Cat. Ungulata Brit. Mus.* p. 238 (1852), *Cat. Ruminants Brit. Mus.* p. 91 (1872); Brooke, *Proc. Zool. Soc.* 1878, p. 924; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 31 (1881).

Homelaphus, Gray, *Cat. Ruminants Brit. Mus.* p. 90 (1872).

Nanelaphus, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 360 (1873), lxxix. part i. p. 31 (1879), in part.

Doryceros, Fitzinger, *op. cit.* lxviii. p. 360 (1873), lxxix. p. 23 (1879).

Characters.—Antlers in the form of simple unbranched spikes. Metatarsal, and in two instances also the tarsal, gland and tuft absent. Tail very short. Face elongated; face-gland small and exposed, and the gland-pit deep and triangular; the crown of the head tufted, and the hair of the face radiating from two whorls, one of which is situated on the crown of the head and the other below the line of the eyes, so that while the hair of the forehead, as in other deer, is directed upwards towards the antlers, that of the nose is directed downwards towards the muzzle. Upper canines occasionally present in old males. Hair fine and smooth. Size small; build clumsy, with the back much arched; the profile of the face convex. Fawns spotted with white. The ears are of medium length; the upper lip has a pair of white spots on each side of the nose, and the lower lip is marked by a larger spot of white in the middle line.

It may be mentioned that the term brocket properly belongs to young red deer stags, but in semi-scientific literature is now universally applied to the members of the present group. Fossil remains of brockets occur in the cavern-deposits of Lagoa Santa, Minas Geraes, Brazil, and likewise in the Plistocene beds of the Argentine pampas, but their specific determination stands in need of revision.

In regard to the specific representatives of the group, Sir Victor Brooke, in 1878, wrote as follows:—It is now many years since I commenced the study of this difficult group of the *Cervidae*; but although I have examined the specimens contained in nearly all the continental museums, and made a private collection of some importance, I must confess that I am still far from a satisfactory understanding of the subject. The complete absence of cornual and cranial characters renders it exceedingly difficult to grasp the characteristic peculiarities of the different modifications of the form, six or seven of which are, I think, probably persistent, and worthy of specific recognition." Fuller series of specimens are still urgently required before our knowledge of the group can be regarded as approaching completion. In the retention of a spotted coat by the fawns the sub-genus is less specialised than the last; but the loss of the metatarsal gland and the simple form of the antlers are specialised, or degraded, and not primitive features. As already mentioned, the circumstance that species of the *Blastoceros* group with antlers nearly or quite as highly developed as the living forms occur in the Monte Hermoso beds of Argentina, which were

deposited just about the time that deer had first reached South America, and the fact that brockets are known only from Central and South America, forms a sufficient proof that the group is a comparatively modern and degraded one.

Mazama is taken as the name for the sub-genus, and hence for the genus, on the authority of Dr. Merriam in the passage cited above. Sir Victor Brooke rejected the earlier *Subulo* in favour of the later *Coassus* on account of its similarity to the still earlier *Subula*. The genus *Doryceros* was established by Fitzinger for the wood-brocket on account of the absence of the tarsal gland, but since the metatarsal gland is so variable and inconstant in the sub-genus *Dorcelaphus*, this can scarcely be regarded as a character of even sub-generic value.

Distribution.—The hottest portions of the Neotropical region.

1. THE RED BROCKET—MAZAMA RUFA

Cervus rufus, F. Cuvier, *Dict. Sci. Nat.* vol. vii. p. 127 (1817); Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 465 (1879).

Cervus (Subulo) rufus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 140, v. p. 318 (1827); Goeldi, *Mammíferos do Brasil*, p. 108 (1893).

Subulo rufus, Jardine, *Naturalist's Library—Mamm.* vol. iii. p. 178 (1835).

(?) *Subulo apura*, Swainson, *Classif. Quadrupeds*, p. 295 (1835).

Coassus rufus, Gray, *List Mamm. Brit. Mus.* p. 174 (1843), *Cat. Ungulata Brit. Mus.* p. 238 (1852), *Cat. Ruminants Brit. Mus.* p. 92 (1872), *Handlist Ruminants Brit. Mus.* p. 161 (1873); Quelch, *Zoologist*, ser. 3, vol. xvii. p. 19 (1893).

Cervus (Subulo) dolichurus, Wagner, in Schreber's *Säugethiere*, vol. iv. p. 389 (1844).

Subulo dolichurus, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 359 (1873), lxxix. part i. p. 10 (1879).

Subulo rufus, Fitzinger, *op. cit.* lxxviii. p. 360 (1873), lxxix. p. 11 (1879).

Cariacus rufus, Brooke, *Proc. Zool. Soc.* 1878, p. 925.

Cervus (Coassus) rufus, Ihering, *Mammíferos de S. Paulo*, p. 15 (1894).

Characters.—Size relatively large, and build heavy, the height at the shoulder being about 27 inches. General colour of pelage glistening brownish red, sometimes with minute dark tips to the hairs; sides of neck and flanks reddish gray; throat, under surface of upper part of neck, and inner side of thighs whitish gray; tail brownish red above, white below and at the tip; a small whitish streak on the rump, a white spot on the front of the lower lip, and a smaller spot on each side of the upper lip below the nose; antlers yellowish white.

The large size, heavy build, and uniformly brownish red coloration at all seasons and all ages (except the very young fawns), are the most distinctive features of this handsome species. The type specimen was obtained from Dutch Guiana, and is preserved in the museum at Paris.

Distribution.—Guiana, through Brazil, to Paraguay.

Habits.—In Brazil, where it is known by the name of veados pardos, or veados mateiros, this brocket is found alike in dense forests and on the open campos, generally singly, and apparently only at certain seasons in pairs. Like most deer, it is of an inquisitive, but at the same time of a very timid and cautious disposition. It is nocturnal in its habits, issuing forth to feed about sunset, and returning to its lair, which is generally under some thick bush, soon after the sun is above the horizon. Various plants and the leaves and young shoots of trees form its chief nutriment, but in the neighbourhood of cultivated lands it inflicts much damage on the crops, being very partial to the young shoots of melons, budding maize, cabbages, and especially beans. The female gives birth, as a rule, only to a single fawn, which is born in December or January; the young animal being able to follow its mother in from three to five days after birth. When danger is at hand, the doe conceals her fawn in thick covert, and herself takes to flight. Where the forest is not too thick, these brockets can be run down by good hounds in half an hour or so; if taken sufficiently young, the fawns can be readily tamed.

2. THE STREAK-EYED BROCKET—*MAZAMA SUPERCILIARIS*

Coassus superciliaris, Gray, *Proc. Zool. Soc.* 1850, p. 242, plate xxv, *Ann. Mag. Nat. Hist.* ser. 2, vol. ix. p. 432 (1852), *Cat. Ungulata Brit. Mus.*

p. 239 (1852), *Cat. Ruminants Brit. Mus.* p. 92 (1872), *Hand-list Ruminants Brit. Mus.* p. 160 (1873).

Cervus (Subulo) superciliaris, Wagner, Schreber's *Säugethiere*, vol. v. p. 386 (1855).

Subulo superciliaris, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 360 (1873), lxxix. part i. p. 18 (1879).

Cariacus superciliaris, Brooke, *Proc. Zool. Soc.* 1878, p. 926.

Characters.—Very closely allied to the last, of which it is not improbably merely a local variety or colour-phase. General colour of pelage shining brownish red; neck, head, hocks, and front of fore-legs whitish gray; forehead blackish, with a distinct streak over the eye.

The type specimen is in the British Museum.

Distribution.—Probably Brazil.

3. THE BLACK-FACED BROCKET—*MAZAMA TEMA*

Mazama tema, Rafinesque, *Amer. Month. Mag.* vol. i. p. 44 (1817).

Cervus rufinus, Pucheran, *Arch. Mus. Paris*, vol. vi. p. 491 (1851).

Coassus rufinus, Gray, *Hand-list Ruminants Brit. Mus.* p. 162 (1873).

Subulo rufinus, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 360 (1873), lxxix. part i. p. 17 (1879).

Cariacus rufinus, Brooke, *Proc. Zool. Soc.* 1878, p. 925.

Cariacus tema, Alston, *Biol. Centr. Amer.*—*Mamm.* p. 118 (1879); Rhoads, *Amer. Naturalist*, vol. xxviii. p. 526 (1894).

Characters.—Smaller than the red brocket, the height at the shoulder being about $25\frac{1}{2}$ inches. General colour of pelage bright shining brownish red; throat, chest, and under-parts blackish red, becoming darker on the abdomen; lower part of hind-leg, front and outer side of fore-leg, and lower part of face shaded with bluish black; hinder and inner side of fore-leg like the under-parts, upper part of hind-leg like the back; tail like back above, white below; the usual white spots on the lips; antlers whitish horn-colour, and less rugose than those of the red brocket.

The distinctive features of this species are the size, the dark shading of the face and limbs, and the blackish red (instead of whitish) throat. The type specimen is in the museum at Paris.

Distribution.—Ecuador, at elevations of 12,000 feet and over.

NATIONAL BUREAU OF STANDARDS
WASHINGTON, D. C. 20540



ECUADOR PUDU (1) AND CENTRAL AMERICAN BROCKET (2).

4. THE CENTRAL AMERICAN BROCKET—*MAZAMA SARTORII*

Cervus humboldtii, Wiegmann, *Isis*, 1833, p. 954,—no description.

Cervus sartorii, de Saussure, *Rev. Mag. Zool.* ser. 2, vol. xii. p. 252 (1860).

Subulo humboldtii, Fitzinger, *SB. Ak. Wien*, vol. lxxix. p. 20 (1879).

Cariacus rufinus, Alston, *Biol. Centr. Amer.—Mamm.* p. 118 (1879), *nec* Pucheran.

Plate XXIV, fig. 2

Characters.—Distinguished from the preceding mainly, if not entirely, by its inferior dimensions, the height at the shoulder being only 20½ inches. The throat, neck, and chest are light fawn, and the abdomen white; the dark shading occupies the lower part of the face, the front of the fore-legs, and the outer side of the hind-limbs.

This brocket, of which the type is in the Paris Museum, was long confounded with the black-faced brocket; and it should probably be regarded as a sub-species rather than a species. The figure in the plate is taken from a mounted specimen now exhibited in the British Museum.

Distribution.—Central America, especially Guatemala.

5. THE WOOD-BROCKET—*MAZAMA NEMORIVAGA*

Moschus americanus, Erxleben, *Syst. Regn. Animal.* p. 324 (1777).

Cervus nemorivagus, F. Cuvier, *Dict. Sci. Nat.* vol. vii. p. 485 (1817); Ihering, *Mammiferos de S. Paulo*, p. 14 (1894), as synonym of *simplicicornis*.

Cervus simplicicornis, Wied. *Naturgeschichte Brasil*, vol. ii. p. 596 (1826); Burmeister, *Descript. Phys. Répub. Argent.* vol. iii. p. 466 (1879); Goeldi, *Mammiferos do Brasil*, p. 108 (1893).

Cervus (Subulo) nemorivagus, H. Smith, in Griffith's *Animal Kingdom*, vol. iv. p. 142, v. p. 319 (1827).

Cervus (Subulo) simplicicornis, H. Smith, *op. cit.* vol. iv. p. 141, v. p. 381 (1827).

Passalites nemorivagus, Gloger, *Handbuch Naturgeschichte*, p. 140 (1841).

Coassus nemorivagus, Gray, *Cat. Ungulata Brit. Mus.* p. 238 (1852), *Cat.*

Ruminants Brit. Mus. p. 91 (1872), *Hand-list Ruminants Brit. Mus.* p. 160 (1873); Quelch, *Zoologist*, ser. 3, vol. xvii. p. 19 (1893); Rendall, *ibid.* ser. 4, vol. i. p. 345 (1897).

Coassus simplicicornis, Gray, *loc. cit.*; Quelch, *Zoologist*, ser. 3, vol. xvii. p. 19 (1893).

Doryceros nemorivagus, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 360 (1873), lxxix. part i. p. 23 (1879).

Cariacus simplicicornis, Brooke, *Proc. Zool. Soc.* 1878, p. 925.

Cariacus nemorivagus, Brooke, *loc. cit.* (1878).

Cervus (Coassus) simplicicornis, Ihering, *Mammiferos de S. Paulo*, p. 15 (1894).

Characters.—The type of the genus *Doryceros*, which, according to Fitzinger, is distinguished from all the preceding forms by the absence of the tarsal gland and tuft. Size small, typically 19 inches at the shoulder. General colour of the typical form varying from pale pepper-and-salt brown to grayish or whitish, with a distinct streak on the forehead before the front of the eyes; never any sign of reddish at any season; hairs of the back ringed with yellowish red below the tip; antlers short, fine, and dirty white in colour. Build light and slender.

In the form known as *C. simplicicornis*, which is regarded by Fitzinger, Goeldi, and Ihering as specifically inseparable from *nemorivaga*, although kept distinct by Sir Victor Brooke, the streak on the forehead is wanting. As both forms are met with in British Guiana, they seem scarcely worthy even of sub-specific separation.

The type specimens of both forms are preserved in the Paris Museum, that of *nemorivaga* being from Guiana, and that of *simplicicornis* from Brazil. The occurrence of both forms in British Guiana is mentioned by Mr. Quelch in the passage cited. Five inches and one-eighth is the maximum recorded length of the antlers.

Distribution.—Guiana, Colombia, Bolivia, Brazil, and Trinidad.

Habits.—In Brazil, where it is known as the vira, or veadó catigueiro, this brocket inhabits the open campos and thin jungles of the interior, avoiding the dense forests of the coast region. In Trinidad it abounds on the borders of the high forests, where it inflicts much damage on young plantations of cocoa and nutmeg. Its extreme wariness renders it difficult of approach. The female produces a pair of fawns annually.

6. THE PERUVIAN BROCKET—MAZAMA TSCHUDII

Cervus (Subulo) tschudii, Wagner, Schreber's *Säugethiere*, vol. v. p. 386 (1855).

Cervus (Subulo) simplicicornis major, Wagner, *loc. cit.* (1855).

Doryceros tschudii, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 360 (1873), lxxix. part i. p. 30 (1879).

Coassus whitelyi, Gray, *Ann. Mag. Nat. Hist.* ser. 4, vol. xii. p. 163 (1873), *Hand-list Ruminants Brit. Mus.* p. 162, plate xxxii (1873).

Cariacus whitelyi, Brooke, *Proc. Zool. Soc.* 1878, p. 926.

Characters.—Closely allied to the wood-brocket, from which it is distinguished by its somewhat inferior size, the nearly smooth antlers, and certain details of coloration. The pelage of the back is darker than in *M. nemorivaga*, and the under-parts and inner side of the limbs pure white instead of yellowish white; the hairs of the back lack the sub-terminal yellowish red ring. *C. whitelyi* was founded on an immature skull from Peru in the British Museum, probably belonging to the present form. The species is only known to me by description.

Distribution.—Peru, at elevations of 16,000 feet above the sea-level on the western slopes of the Cordillera, in the same districts inhabited by *M. antisiensis*.

7. THE PIGMY BROCKET—MAZAMA NANA

Cariacus nanus, Lesson, *Nouv. Tabl. Hist. Nat.* p. 173 (1842).

Cervus (Subulo) nanus, Wagner, Schreber's *Säugethiere*, vol. v. p. 386 (1855).

Nanelaphus namby, Fitzinger, *SB. Ak. Wien*, vol. lxxviii. part i. p. 361 (1873), lxxix. part i. p. 32 (1879).

Nanelaphus nambi, Goeldi, *Mammiferos do Brasil*, p. 108 (1893).

Cervus (Coassus) nanus, Ihering, *Mammiferos de S. Paulo*, p. 16 (1894).

Characters.—Imperfectly known. Size very small, inferior to that of the wood-brocket, from which this form is said to be distinguished by the presence of a small tarsal tuft and the larger size of the face-gland. Tail terminating in a tuft of longish hairs; hair rough and thick; ears thickly haired externally, short-haired internally. General colour of upper-parts

uniformly dark brown with a tinge of reddish ; under-parts lighter ; tail coloured like the back above, white below and at the tip ; a small white spot beneath each eye ; lips white, the upper one becoming dirty white near the muzzle ; ears externally dark brown, internally bluish white ; tarsal tuft white.

This species is the type of Fitzinger's genus *Nanelaphus*, in which the Chilian pudu was also included. In Europe it appears to be represented only by a specimen in the museum at Vienna, and further information is required as to its affinities. Judging from the description, it seems to be a brocket rather than a pudu ; the tail being more developed than in the latter, and the tarsal gland also present. The white under surface of the tail, and the white on the lips are also characters of the brockets, among which group the species is placed by Dr. von Ihering.

Distribution. —Central Brazil, in the neighbourhood of Mato-Grosso, where the species is known as noambibororoca, or veado pequeno. It lives more generally on the borders of the campos than in the forests.

INCERTÆ SEDIS

1. *Mazama inornata*

Homelaphus inornatus, Gray, *Cat. Ruminants Brit. Mus.* p. 90 (1872).

Coassus inornatus, Gray, *Hand-list Ruminants Brit. Mus.* p. 162 (1873).

Named on the evidence of an immature stuffed male in the British Museum, measuring rather over 24 inches in height. Gray's description is as follows :—"It is of a pale brown colour, more dusky on the head, back of the neck, shoulders, and outside of the legs ; a distinct yellowish streak over the upper edge of the orbit ; the inside of the upper part and the front edge of the thighs and the under side of the tail white. It has no appearance of natural metatarsal glands. The ears are moderate and nakedish. The nose and middle of the chin are dark blackish, with a large triangular spot on the front of the upper lip,¹ and a narrow white cross-band immediately under the front of the lower lip." The antlers are represented by small knobs.

2. *Mazama aurita*

Coassus auritus, Gray, *Proc. Zool. Soc.* 1850, p. 242, *Ann. Mag. Nat. Hist.* ser. 2, vol. ix. p. 432 (1852), *Cat. Ungulata Brit. Mus.* p. 239 (1852), *Cat. Ruminants Brit. Mus.* p. 92 (1872).

¹ In the original misprinted *leg*.

Cervus (Subulo) auritus, Wagner, Schreber's *Säugethiere*, vol. v. p. 336 (1855).

Subulo auritus, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 360 (1873), lxxix. part i. p. 19 (1879).

Founded on a skin reported to be from Brazil, but now lost ; not improbably the female of *M. rufa*.

XIII. THE PUDUS—GENUS PUDUA

Pudu, Gray, *Proc. Zool. Soc.* 1850, p. 242, *Cat. Ruminants Brit. Mus.* p. 92 (1872).

Nanelaphus, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 360 (1873), lxxix. part i. p. 31 (1879), in part.

Pudua, Garrod, *Proc. Zool. Soc.* 1877, p. 18 ; Brooke, *ibid.* 1878, p. 296 ; de Winton, *ibid.* 1896, p. 508.

Characters.—Skull and metacarpals generally as in *Mazama*. Size very small ; hair coarse and brittle ; antlers in the form of short, simple spikes ; cannon-bones very short ; tail very short or wanting ; no whorls in the hair of the face, which is directed regularly backwards from the muzzle to the crown ; ears large and rounded ; face-gland moderately large and exposed, and the gland-pit very deep and oval ; naked portion of muzzle below nostrils deep ; tarsal and metatarsal glands and tufts absent ; upper canines wanting, and the middle pair of lower incisors not greatly expanded ; in the ankle-joint (tarsus) the external cuneiform united with the naviculo-cuboid bone.

In the characters of the skull and several other features the pudus are very closely connected with the guemals and brockets, from the latter of which they are distinguished by the uniformly upward direction of the hair of the face. This, however, is only a character of sub-generic importance (according to the scheme of classification here employed) ; and the justification for ranking the group as a separate genus rests upon the peculiar structure of the ankle-joint, which is quite different from that of all the other American deer.

Distribution.—Western side of the Neotropical region.

I. THE CHILIAN PUDU—PUDUA PUDU

Capra pudu, Molina, *Saggio Storia Nat. Chili*, p. 310 (1782).

Ovis pudu, Kerr, *Animal Kingdom*, p. 35 (1792).

Cervus humilis, Bennett, *Proc. Zool. Soc.* 1831, p. 27.

Cervus (Pudu) humilis, Gray, *Proc. Zool. Soc.* 1850, p. 242.

Pudu humilis, Gray, *Cat. Ungulata Brit. Mus.* p. 240 (1852), *Proc. Zool. Soc.* 1864, p. 105, *Cat. Ruminants Brit. Mus.* p. 93 (1872), *Hand-list Ruminants Brit. Mus.* p. 163 (1873).

Pudu chilensis, Gray, *Cat. Ungulata Brit. Mus.* plate xxxvi (1852).

Cervus pudu, Sclater, *Proc. Zool. Soc.* 1871, p. 238.

Nanelaphus pudu, Fitzinger, *SB. Ak. Wien*, vol. lxviii. part i. p. 361 (1873), lxxix. part i. p. 34 (1879).

Pudua humilis, Garrod, *Proc. Zool. Soc.* 1877, p. 18; Brooke, *ibid.* 1878, p. 927; de Winton, *ibid.* 1896, p. 510.

Coassus humilis, Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 31 (1881).

Characters.—The type species. Size very small, the height at the shoulder being about $13\frac{1}{2}$ inches. Tail distinct. General colour of upper-parts and outer surface of limbs reddish brown, with a speckling of fawn, darkest on the head, passing into grayish on the neck, on the fore-neck more distinctly speckled with yellowish fawn, and on the under-parts and inner surface of the limbs fawn, yellower in some parts, and redder in others. Ears relatively long. In the skull the premaxillæ separated by a distinct interval from the nasal bones.

Distribution.—Chilian Andes and southwards to the archipelago of Chiloe, descending in winter to the plains of the southern provinces. Nothing seems to be recorded with regard to the mode of life of this pretty little deer, which has several times been represented by living examples in the London Zoological Gardens.

2. THE ECUADOR PUDU—*PUDUA MEPHISTOPHELES*

Pudua mephistopheles, de Winton, *Proc. Zool. Soc.* 1896, p. 508, plate xix.

Plate XXIV, fig. 1

Characters.—Known by a single immature female, measuring about $12\frac{1}{2}$ inches at the shoulder. Hair of the body long and coarse, its basal portion peculiarly brittle and pith-like; the terminal half of each hair black with a ferruginous tip, producing a rich brown colour. Back darker than the flanks, owing to the hairs having broader black bands with correspondingly

reduced coloured tips ; on the neck the tips paler and longer, the black being much reduced, which gives a tawny appearance ; towards the head the black again increases, till the shorter hairs of the ears, face, and chin are almost black. Ears thickly haired inside and out, the hairs on the inside being broadly tipped with white. Feet black, most of the hairs being minutely tipped with buff ; inner sides of the legs and the abdomen clothed with long yellowish hair of a finer and more ordinary character. Ears very short and partially concealed by the rough hair. Naked portion of the muzzle from the nostrils downwards deep. Tail entirely wanting. When full grown, the animal would probably be about 14 or 15 inches high at the shoulder, and thus taller than the Chilian species.

The distinctive features of this species are the absence of the tail, the blackish-brown ground-colour sprinkled with bright rufous, and the nearly black face and legs. The ears, too, are relatively short, with long fur, especially internally, where they are white. In the skull the premaxillæ ascend to reach the nasal bones, whereas in *P. pudu* the two are separated by a short interval.

Distribution.—Paramo of Papallacta, Ecuador, where it appears to be very scarce.

B. THE ABERRANT DEER—SUB-FAMILY MOSCHINÆ

Characters.—Distinguished from the *Cervinæ* by the following structural features. The liver is provided with a gall-bladder, as in many hollow-horned ruminants. In the skull the canal situated just within the margin of the eye and leading into the chamber of the nose opens by a single aperture, instead of two orifices, as in the true deer. There is no face-gland or gland-pit below the eye. The hemispheres of the brain are comparatively smooth, having few convolutions. There are also differences in certain internal organs of the female. Antlers wanting in both sexes.

This sub-family contains only the musks, or musk-deer, of which there appear to be two species.

That the musks are widely different from the typical *Cervidæ*, must be freely admitted ; and were it not that the multiplication of groups is to be deprecated, there is much to be said in favour of referring them to a family apart (*Moschidæ*). They were excluded from the *Cervidæ* by Fitzinger,

and Sir Victor Brooke seemed rather inclined to take the same view. Garrod, also, was strongly against their inclusion in the *Cervidæ*, remarking that "when we consider the genus *Moschus* in its relations to the other ruminants, it seems to me that to call it a deer is altogether against the tendency of the facts at our disposal." On the other hand, Rütimeyer unhesitatingly classed the genus in the deer family, even going so far as to place it next *Hydrelaphus*. But Sir William Flower, while also including it in the *Cervidæ*, regarded it as a very early and distinct offshoot from the other branch of that family. A somewhat similar relationship to the true deer is presented by the giraffes, and it must be confessed that if the latter are regarded as a distinct family, and not a sub-family of *Cervidæ*, it is a little illogical not to give the same rank to the musks. Still, I am loth to interfere with the system of classification generally adopted in England more than seems necessary.

XIV. THE MUSKS—GENUS MOSCHUS

Moschus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 91 (1766); Flower, *Proc. Zool. Soc.* 1875, p. 159; Garrod, *ibid.* 1877, p. 287; Rütimeyer, *Abh. schweiz. pal. Ges.* vol. viii. p. 19 (1881).

Characters.—Build stout and heavy, with the limbs long and thick, the hinder pair considerably exceeding the front in this respect, and the rump elevated. Hair coarse, thick, brittle, minutely waved, and in structure resembling pith. Ears large. Upper canines greatly developed in the males, and projecting far below the level of the lips, in females much smaller. No tarsal or metatarsal glands or tufts; lateral metacarpal bones represented by their lower extremities; main hoofs narrow and pointed, lateral hoofs very large and functional. Tail very short and glandular, in the male terminating in a tuft, in the female evenly haired throughout. The male with a globular gland in the skin of the abdomen secreting the substance known as musk, at least during the breeding-season. Naked portion of muzzle large and completely surrounding the nostrils.

Among the many structural peculiarities of the genus, not the least remarkable are those connected with the lateral digits of the limbs. In the fore-limbs the joints of these digits are supplied with special tendons from the deep flexor muscle of the leg, so that the lateral hoofs are capable

of a large amount of movement and lateral expansion. "The special office performed by the lateral phalanges," writes Sir Victor Brooke, "is the prevention of the animal slipping when rushing at speed down slopes or sinking in swampy ground ; and this function is effected without danger of the displacement of these delicate structures by means of strong ligamentous bands developed in the sheath surrounding them, which bind them firmly in their normal position."

Distribution. —Eastern part of the Eastern Holarctic, and some adjacent districts of the Oriental region.

1. THE HIMALAYAN MUSK—*MOSCHUS MOSCHIFERUS*

Moschus moschiferus, Linn. *Syst. Nat.* ed. 12, vol. i. p. 91 (1766) ; H. Smith, in Griffith's *Animal Kingdom*, vol. v. p. 301 (1827) ; Gray, *Cat. Ungulata Brit. Mus.* p. 244 (1852), *Cat. Ruminants Brit. Mus.* p. 96 (1872) ; Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. ii. p. 119 (1864), *Rech. Mamm.* p. 176 (1868-74) ; Jerdon, *Mamm. India*, p. 266 (1867) ; Kinloch, *Large Game Shooting*, part i. p. 41 (1869) ; Flower, *Proc. Zool. Soc.* 1875, p. 159 ; Sterndale, *Mamm. India*, p. 494 (1884) ; W. L. Sclater, *Cat. Mamm. Ind. Mus.* part ii. p. 172 (1891) ; Blanford, *Fauna Brit. Ind.—Mamm.* p. 552 (1891) ; Büchner, *Mélanges biol. Ac. St. Pétersbourg*, vol. xiii. p. 163 (1890-91).

Moschus sibiricus, Pallas, *Spicil. Zool.* vol. xiii. p. 29 (1799) ; Gray, *Cat. Ungulata Brit. Mus.* p. 243 (1852).

Moschus altaicus, Eschscholtz, *Isis*, 1830, p. 606.

Moschus moschiferus altaicus, Brandt, *Medicin. Zool.* vol. ii. p. 347 (1833).

Moschus chrysogaster, Hodgson, *Journ. As. Soc. Bengal*, vol. viii. p. 203 (1839) ; Gray, *Cat. Ungulata Brit. Mus.* p. 245 (1852), *Cat. Ruminants Brit. Mus.* p. 97 (1872).

Moschus leucogaster, Hodgson, *Journ. As. Soc. Bengal*, vol. viii. p. 203 (1839) ; Gray, *Cat. Ungulata Brit. Mus.* p. 245 (1852), *Cat. Ruminants Brit. Mus.* p. 96 (1872).

Moschus saturatus, Hodgson, *Journ. As. Soc. Bengal*, vol. viii. p. 203 (1839).

Moschus moschiferus fasciatus, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. ii. p. 119 (1864) ; Gray, *Cat. Ruminants Brit. Mus.* p. 96 (1872).

Moschus moschiferus maculatus, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. ii. p. 120 (1864) ; Gray, *Cat. Ruminants Brit. Mus.* p. 96 (1872).

Moschus moschiferus concolor, Milne-Edwards, *Ann. Sci. Nat.* ser. 5, vol. ii. p. 121 (1864) ; Gray, *Cat. Ruminants Brit. Mus.* p. 96 (1872).

Characters.—Height at shoulder about 20 inches, at rump two inches more. General colour of upper-parts some shade of rich dark brown, more or less mottled and speckled with light gray, the individual hairs being white for about three-quarters of their length, then with a white band, followed by a blackish tip ; under-parts and inner side of limbs paler ; chin, inner border of ears, and inside of thighs whitish ; in some instances a white spot on each side of the throat. Considerable individual or local variation of colour is observable, and upon such differences a number of nominal species or varieties have been described, although there is at present little decisive evidence that any of these are entitled to rank as distinct sub-species. While some individuals are paler than ordinary, others tend to the development of a yellowish tint. The animal to which the name *M. chrysogaster* was applied is depicted in Hodgson's sketches as bright sepia-brown sprinkled with golden red above, and golden red or orange beneath, but the tints are probably exaggerated. In the form described as *M. leucogaster* the upper-parts are very dark, with splashes of black on the back and hips, while the under-parts are white or whitish. Other specimens, again, are described as yellowish white all over the upper-parts, and white beneath and on the inner side of the thighs ; and a variety from Kashmir is stated to show lines of grizzled gray spots on the back. The fawns are spotted with yellowish or pure white ; those from Kashmir territory being of a paler tint than the individuals from the Eastern Himalaya.

Distribution.—Forest-clad districts in the Himalaya as far westwards as Gilgit, at elevations of about 8000 feet or higher in summer, thence extending into Tibet, and so on to Siberia and Western China, where the species is found in the southern districts of the province of Kansu. In the Kashmir area the range terminates with the northern limits of forest, the musk-deer being quite unknown in the arid treeless districts of Dras and Ladak, as it is in Baltistan.

Habits.—Although formerly very abundant in the Himalaya, the musk-deer has been so persecuted for the sake of its valuable secretion, that it is a marvel it has not been exterminated. Twenty years ago I found it still

numerous in the more remote valleys north of Kashmir, such as Tilel and Wardwan, but even in such districts it now appears to have become very scarce, although the game laws recently put in force in Kashmir territory may be doing something towards checking the diminution in its numbers. Musk-deer are solitary animals, generally going about alone, and it is seldom, if ever, that more than two adults are seen in company. Although they are chiefly nocturnal, lying up during the greater part of the day under the



FIG. 79.—Musk Deer. From a photograph by the Duchess of Bedford.

shelter of some protecting bush, I have occasionally seen them in remote districts feeding in the early afternoon. In Kashmir territory they are chiefly found near the upper limits of the pine forests, and still more commonly in the still higher zone of birch, where the snow lingers till late in the summer. On the Chinab I have, however, seen them in the dense mixed forest at much lower levels, and in some districts they are met with among the rhododendron forests. When disturbed, they start off in a series of enormous bounds, halting after a few of such leaps to turn and gaze upon the intruder, when they generally afford an easy shot. Cold seems to be a

matter of absolute indifference to them, the thick coat of pithy hair affording an insulating protector capable of maintaining the natural heat in almost any degree of temperature. In its agility and capacity of maintaining its foot-hold on smooth and slippery surfaces of rocks the musk-deer is the equal of the African klipspringer ; but the feet of the two animals display a remarkable difference in their conformation. In the klipspringer the lateral hoofs are minute and functionless, and the main hoofs short and rounded, so that the animal rests on their tips alone. In the musk-deer, on the other hand, both the main and the lateral hoofs are long and pointed, and the animal appears to use the latter by grasping ridges or points of rock.

With regard to its food, General Kinloch states that this consists chiefly of leaves and flowers, although another writer mentions grass and lichens ; but the difference in these statements may be due to locality or season. When standing at gaze, either before or after the first series of bounds, musk-deer will occasionally utter a loud hiss, but, except for loud screams when wounded or captured, no other cry seems to have been noticed. From specimens kept in captivity many years ago in the residency at Katmandu, Nepal, it appears that the pairing-season takes place in January, and that the young are born in the following June. Although occasionally there are twins, there is usually but a single fawn produced at a birth. To make up for this slow rate of propagation, the fawns are able to breed within a year from their birth.

The musk-pod of the males, which, as already stated, is situated on the abdomen, is taken out entire and dried ; the contents usually weighing about an ounce, and selling for some sixteen or eighteen shillings. The quantity of musk in the pod varies, however, according to the season and the age of the animal from which it is taken. It has been stated that the secretion is only yielded during the pairing-season, but if Hodgson be right in saying that this occurs in January, the former statement cannot be correct, as I have frequently shot musk-deer with full pods in May and June. The flesh has no musky flavour, if the pod be removed immediately after death, and makes excellent soup.

In addition to the large number shot, many musk-deer are captured by means of snares in certain parts of the Himalaya. General Macintyre describes the method as follows :—"A low fence is made of boughs, etc., along the ridge of a hill, sometimes a mile or more in length. At intervals

of 100 or 150 yards are gaps. The musk-deer, crossing the ridge from one valley to another, come across this fence, and to save themselves the trouble of jumping over it, walk alongside until, seeing a little gap, they try to go through it. But in each gap a noose of strong string is placed on the ground, and tied to a stout sapling, bent downwards. The noose is so arranged that when the deer tread inside it, the sapling is loosed and flies back, leaving the noose tied tightly round the animal's leg. The people visit these fences every two or three days, and secure the deer thus caught, and repair the fences and nooses, which are often carried away or destroyed by larger game."

The Hindustani name of the musk-deer is kastura. In English parks these deer flourish well, and there are many at Woburn Abbey, and also at Leonard's Lee, Sussex. They show but little timidity, and allow themselves to be approached closely before starting off with the characteristic bounds.

2. THE KANSU MUSK—*Moschus sifanicus*

Moschus sifanicus, Büchner, *Mélanges biol. Ac. St. Pétersbourg*, vol. xiii. p. 162 (1891, separate copies dated 1890).

Characters.—Size and general coloration similar to the last, but the ears much longer, and, instead of being similar externally to the back, differently coloured. Externally they are more or less completely deep black, or black at the base with a broad yellowish tip, the margin of the upper half having a blackish or brownish band; internally the margin is covered with yellowish hair showing a more or less decided rufous tinge. The skull is more massive, and longer in its anterior half, the nasal bones being narrower, more elongated, and articulating with only a small portion of the frontals.

There is no example of this form in the British Museum.

Distribution.—Southern Kansu, China, where the Himalayan species also occurs.

APPENDIX

BIBLIOGRAPHY OF THE CERVIDÆ

THE following list, which makes no pretence to be complete, includes only works and papers devoted exclusively, or almost so, to deer :—

ALSTON, E. R. On Female Deer with Antlers. *Proc. Zool. Soc.* 1879, pp. 296-299.

BANGS, O. The Florida Deer. *Proc. Soc. Washington*, vol. x. pp. 25-28 (1896).

BARTON, B. S. Account of the *Cervus wapiti*, or Southern Elk of Northern America. *Philad. Med. and Phys. Journ.* vol. iii. part i. suppl. pp. 36-55 (1808).

BEAVAN, R. C. Notes on the Panolia Deer (*Cervus eldi*). *Proc. Zool. Soc.* 1867, pp. 759-766.

BLANFORD, W. T. On some Stags' Horns from the Thian-Shan Mountains in Central Asia. *Proc. Zool. Soc.* 1875, pp. 637-640.

——— Exhibition of, and Remarks upon, two Heads and a Skin of the Yarkand Stag. *Ibid.* 1892, pp. 116 and 117.

——— On a Stag, *Cervus thoroldi*, from Tibet, and on the Mammals of the Tibetan Plateau. *Ibid.* 1893, pp. 444-449, plate xxxiv.

BLYTH, E. A general Review of the Species of True Deer, or Elaphoid form of *Cervus*, comprising those more intimately related to the Red Deer of Europe. *Journ. As. Soc. Bengal*, vol. x. pp. 736-750 (1841).

——— Note on the Races of Reindeer. *Ibid.* vol. xxix. pp. 376-384 (1861).

——— Notes upon three Asiatic Species of Deer, *Rucervus duvaucelli*, *R. schomburgki*, *Panolia eldi*. *Proc. Zool. Soc.* 1867, pp. 835-842.

BROOKE, Sir V. On *Hydropotes inermis* and its cranial characters, as compared with those of *Moschus moschiferus*. *Proc. Zool. Soc.* 1872, pp. 522-525.

——— On Sclater's Muntjac and other Species of the genus *Cervulus*. *Ibid.* 1874, pp. 33-42.

——— On a new Species of Deer from Persia. *T.c.* pp. 42 and 43.

- BROOKE, Sir V. On a new Species of Deer from Mesopotamia. *Proc. Zool. Soc.* 1875, pp. 261-266.
- Supplementary Note on *Cervus mesopotamicus*. *Ibid.* 1876, pp. 298-303.
- On *Cervus schomburgki* (Blyth). *T.c.* pp. 304-307.
- — On the Deer of the Philippine Islands, with the Description of a new Species. *Ibid.* 1877, pp. 51-60.
- — On the Classification of the *Cervidae*, with a Synopsis of the existing Species. *Ibid.* 1878, pp. 883-928, plate lv.
- BÜCHNER, E. Bemerkungen über die Verbreitung des Edelhirsches im Östlichen Russland. *Ann. Mus. Zool. St. Pétersbourg*, 1896, pp. 387-399.
- CAMERON, A. G. The value of the Antlers in the Classification of the Deer. *Field*, 1892, April 30, p. 625; May 14, p. 703; 21, p. 741; June 11, p. 860.
- — Deer and Deer-Stalking in the Scottish Highlands. *Ibid.* 1896, Aug. 8, p. 222; 15, p. 267; 22, p. 308; 29, p. 350.
- CATON, J. D. The Antelope and Deer of America. New York, 1877, 8vo.
- DAWKINS, W. B. Contributions to the history of the Deer of the European Pliocene and Miocene Strata. *Quart. Journ. Geol. Soc.* vol. xxxvii. pp. 402-420 (1877).
- — British Pleistocene Mammalia—Part vi. *Cervidae*. *Mon. Pal. Soc.* 1887.
- DEPÈRET, C. Nouvelles études sur les Ruminants pliocènes et quaternaires d'Auvergne. *Bull. Soc. géol. France*, ser. 3, vol. xii. pp. 247-284, plates v-viii (1884).
- EVANS, G. H. Notes on the Thamin, or Brow-antlered Deer. *Journ. Bombay Nat. Hist. Soc.* vol. ix. pp. 326-333 (1895).
- ELIOT, D. G. Remarks upon two Species of Deer of the genus *Cervus* from the Philippine Archipelago. *Publ. Field Columbian Mus.—Zool.* vol. i. p. 157 (1897).
- FITZINGER, L. J. Die Gattungen der Familie der Hirsche (*Cervi*) nach ihrer natürlichen Verwandtschaft. *SB. Ak. Berlin*, vol. lxviii. part i. pp. 332-362 (1873).
- Kritische Untersuchungen über die Arten der natürlichen Familie der Hirsche (*Cervi*). *Ibid.* vol. lxix. part i. pp. 519-604 (1874), lxx. part i. pp. 239-333 (1874), lxxviii. part i. pp. 301-376 (1879), lxxix. part i. pp. 7-71 (1879).
- FLOWER, W. H. On the structure and affinities of the Musk-Deer (*Moschus moschiferus*, Linn.). *Proc. Zool. Soc.* 1875, pp. 159-190.
- FORBES, W. H. Supplemental notes on the Anatomy of the Chinese Water-Deer (*Hydropotes inermis*). *Proc. Zool. Soc.* 1882, pp. 636-638.
- GARROD, A. H. On the Chinese Deer named *Lophotragus michianus* by Mr. Swinhoe. *Proc. Zool. Soc.* 1876, pp. 757-765.

- GARROD, A. H. Notes on the Anatomy of the Musk-Deer (*Moschus moschiferus*).
Ibid. 1877, pp. 287-292.
- Notes on the Anatomy of the Chinese Water-Deer. *T.c.* pp. 789-792.
- GRAY, J. E. Memoir on the genus *Moschus*, Linn., with descriptions of two new Species. *Proc. Zool. Soc.* 1836, pp. 63-65.
- Observations upon the Tufts of Hair observable upon the posterior Legs of the genus *Cervus*, as a character of that group, and as means of subdividing it into sections. *T.c.* pp. 66-68.
- On a very large Roe-Deer (*C. leucotis*) in the collection of the Earl of Derby. *Ibid.* 1849, pp. 64 and 65.
- Synopsis of the species of Deer (*Cervina*), with description of a new Species in the Gardens of the Society. *Ibid.* 1850, pp. 222-243, and *Ann. Mag. Nat. Hist.* ser. 2, vol. ix. pp. 413-433 (1852).
- On *Rusa japonica*, a new Species of Rusa Deer from Japan. *Ann. Mag. Nat. Hist.* ser. 3, vol. vi. pp. 218 and 219 (1860).
- Notice of a Stag from North China sent by Mr. Swinhoe to the Zoological Society. *Proc. Zool. Soc.* 1861, pp. 236-238.
- On the Long-eared or Mule-Deer of North America. *Ann. Mag. Nat. Hist.* ser. 3, vol. xviii. pp. 338 and 339 (1866).
- On the Guemal or Roebuck of Southern Peru (*Xenelaphus huamel*). *Proc. Zool. Soc.* 1869, pp. 496-499.
- A new Deer from Chili (*Anomalocera huamel*). *Scientific Opinion*, 1869, p. 499.
- The Ahu (*Capreolus pygargus*). *Ann. Mag. Nat. Hist.* ser. 4, vol. x. pp. 407 and 408 (1872).
- On the Guemal (*Huamela leucotis*). *T.c.* pp. 445 and 446 (1872).
- Further remarks on the Guemal of Patagonia (*Huamela leucotis*). *Ibid.* vol. xi. pp. 214-220 (1873).
- On the Wood-Deer of Brazil, *Blastocerus sylvestris*. *Ibid.* vol. xii. pp. 426 and 427 (1874).
- On *Xenelaphus*, *Furcifer*, and *Coassus peruvianus*. *Ibid.* vol. xiii. pp. 331 and 332 (1874).
- GREVÉ, C. Das Elen in Aussterben. *Zool. Garten*, vol. xxxvi. pp. 267-269 (1895).
- GRIMBLE, A. The Deer Forests of Scotland. London, 1896, 4to.
- HARTING, J. E. The Deer of Epping Forest. *Essex Naturalist*, vol. i. pp. 46-62 (1887).

- HEUDE, P. M. Cerfs des Philippines et de L'Indo-Chine. *Mém. hist. nat. emp. Chinois*, vol. ii. pp. 1-64 (1888).
- Catalogue révisé des Cerfs Tachetés (*Sika*). *T.c.* pp. 146-168 (1892), and iii. pp. 98-107 (1897).
- Aperçu sommaire du genre *Hippelaphus*. *Ibid.* vol. iii. pp. 47-52 (1896), and 92-97 (1897).
- HODGSON, B. H. Contributions in Natural History, the Musk-Deer and *Cervus jaral*. *Gleanings in Science*, vol. i. pp. 320-324 (1831).
- Note relative to the account of the Jaral. *Journ. As. Soc. Bengal*, vol. i. pp. 66 and 67 (1832).
- On the Ratwa Deer of Nepal (*Cervus ratwa*). *Asiat. Researches*, vol. xviii. pp. 139-149 (1833).
- Specific description of a new Species of *Cervus* (*C. elaphoides*). *Journ. As. Soc. Bengal*, vol. iv. pp. 648 and 649 (1835).
- Notes on the *Cervus duvaucelii*, Cuvier, or *C. elaphoides* and *bahraiya*, Hodgson. *Ibid.* vol. v. pp. 240-242, and *Proc. Zool. Soc.* 1836, pp. 46-47.
- On three new Species of Musk (*Moschus*) inhabiting the Himalayan Districts (*M. chrysogaster*, *M. leucogaster*, *M. saturatus*). *Journ. As. Soc. Bengal*, vol. viii. p. 202 (1839).
- Note on the *Cervus elaphus* (*elaphoides*?) of the Saal Forest of Nepal (hodie *C. affinis*). *Ibid.* vol. x. pp. 721-724 (1841).
- On a new Organ in the genus *Moschus*. *T.c.* pp. 795 and 796 (1841).
- On a new Species of *Cervus* (*C. dimorphe*). *Ibid.* vol. xii. pp. 889-898 (1843).
- On the Shou or Tibetan Stag (*Cervus affinis*). *Ibid.* vol. xix. pp. 388-394 (1851).
- HOSE, C. H. Description of a new Deer from Mount Dulit, Eastern Sarawak. *Ann. Mag. Nat. Hist.* ser. 6, vol. xii. p. 206 (1893).
- HUET, J. Liste des Espèces dans les Families des Cervidés, Cervulidés, Tragulidés, et des Moschidés. *Bull. Soc. Acclim. Paris*, ser. 4, vol. v. pp. 274-284, 407-508, 545-555, and 721-737 (1888).
- KEILHACK, K. Ueber einen Damhirsch aus dem deutschen Diluvium. *JB. preuss. geol. Landesanst.* 1887, pp. 283-290, plate xi (1888).
- LOCKHART, J. G. Notes on the Habits of the Moose in the Far North of British America in 1865. *Proc. U. S. Mus.* vol. xiii. pp. 305-308 (1891).
- LYDEKKER, R. On a remarkable Antler from Asia Minor. *Proc. Zool. Soc.* 1890, pp. 363-365, plate xxx.

- LYDEKKER, R. On an apparently new Deer from North China in the Menagerie of the Duke of Bedford at Woburn Abbey. *Ibid.* 1896, pp. 930-934, plates xlviii. and xlix.
- On the Deer allied to *Cervus sica*. *Ibid.* 1897, pp. 37-46, plate i.
- MACPHERSON, H. A., and others. The Red Deer. *Fur and Feather Series*. London, 1896, 12mo.
- MANGOLD, C. *Cervus alces* in Aussterben begriffen. *Zool. Garten*, vol. xxxvi. pp. 157-159 (1895).
- MEARNS, E. A. Description of a new Deer (*Dorcelaphus texanus*) from Texas and Northern Mexico. *Proc. Soc. Washington*, vol. xii. pp. 23-26 (1898).
- MERRIAM, C. H. *Cervus roosevelti*, a new Elk from the Olympics. *Proc. Soc. Washington*, vol. xi. pp. 271-275 (1897).
- MEYER, A. B. Die Hirschgeweih-Sammlung im königlichen Schlosse zu Moritzburg, bei Dresden. 2 vols. fol., Dresden, 1883 and 1887.
- MILLAIS, J. G. British Deer and their Horns. London, 1897, 4to.
- MILNE-EDWARDS, A. Note sur le Mi-lou, ou Sseu-pou-siang (*Elaphurus davidianus*), du Nord de la Chine. *Ann. Sci. Nat.—Zool.* vol. v. pp. 380-382 (1866).
- MOELLENDORFF, O. F. Ueber die Sikahirsche. *Zool. Jahrb.* 1887, pp. 588-590.
- MOJSISOVICS, A. Ueber die Geweihbildung des Hochwildes von Bélye. *Mt. Ver. Steiermark*, 1888, pp. 53-73.
- MÜLLER, J. Ein Sumpfhirsch (*Blastocerus paludosus*, Gray) im Berliner Zoologischen Garten. *Zool. Garten*, vol. xxxvii. pp. 49 and 50 (1896).
- NEHRING, A. Ueber *Furcifer antiensis*, d'Orb., and *Cervus brachyceros*, Philippi *SB. Ges. Berlin*, 1895, pp. 9-18.
- NITSCHKE, H. Studien über das Elchwild, *Cervus alces*, Linn. *Zool. Anzeiger*, vol. xiv. pp. 181-191 (1891).
- Bemerkungen über zwei aus Spitzbergen stammende Rentierschädel. *Jh. Ver. Nat. Württ.* 1893, pp. 111-127.
- NOACK, T. Zur Säugethierfauna der Mantschurischen Subregion—Part i. *Cervidae*. *Humboldt*, vol. viii. pp. 1-10 (1889).
- POHLIG, H. Die Cerviden des thüringischen Diluvial-Travertines, mit Beiträgen über andere diluviale und über recente Hirschformen. *Palaeontographica*, vol. xxxix. pp. 215-262, plates xxiv-xxvii (1892).
- POWERSCOURT, Viscount. On the Acclimatisation of the Japanese Deer at Powerscourt. *Proc. Zool. Soc.* 1884, pp. 207-209.

- PUCHERAN, J. Monographie des Espèces du genre Cerf. *Arch. Mus. Paris*, vol. vi. pp. 264-492 (1852).
- QUELCH, J. J. The Deer of British Guiana. *Zoologist*, ser. 3, vol. xvii. p. 19 (1893).
- ROGER, O. Ueber die Hirsche. *CB. Ver. Regensburg*, 1887, pp. 50-93.
- RÜTIMEYER, L. Beiträge zu einer natürlichen Geschichte der Hirsche. *Abh. schweiz. pal. Ges.* vol. vii. pp. 3-8 (1880), viii. pp. 9-97 (1881), x. pp. 3-192 (1883).
- SCLATER, P. L. Note on the Japanese Deer living in the Society's Menagerie. *Proc. Zool. Soc.* 1860, pp. 375-377.
- Note on the Deer of Formosa. *Ibid.* 1862, pp. 150-152, plates xvi and xvii.
- On certain species of Deer now or lately living in the Society's Menagerie. *Trans. Zool. Soc.* vol. vii. pp. 333-352, plates xxviii-xxxix (1871).
- Remarks on *Cervus chilensis* and *Cervus antisiensis*. *Ann. Mag. Nat. Hist.* ser. 4, vol. xi. pp. 213 and 214 (1873).
- Remarks on the Deer of Chili and Western Peru. *Proc. Zool. Soc.* 1875. pp. 44-47.
- SCLATER, W. L. Description of a Stag's Head allied to *Cervus dybowskii*. *Journ. As. Soc. Bengal*, vol. lviii. pp. 186-188, plate xi (1889).
- SCOTT, W. B. *Cervalces americanus*, a fossil Moose, or Elk, from the Quaternary of New Jersey. *Proc. Acad. Philadelphia*, 1885, pp. 181-202, plate ii.
- SWINHOE, R. On the Japanese and Formosan Deer. *Ann. Mag. Nat. Hist.* ser. 3, vol. viii. p. 192 (1861).
- Letter with Observations on some Chinese Deer. *Proc. Zool. Soc.* 1864, pp. 168 and 169.
- On the Cervine Animals of the Island of Hainan (China). *Ibid.* 1869, pp. 652-660.
- On a new Deer from China, *Hydropotes inermis*. *Ibid.* 1870, pp. 89-92.
- On Chinese Deer, with the description of an apparently new species, *Cervus kopschii*. *Ibid.* 1873, pp. 572-576.
- On a small, tufted, Hornless Deer from the mountains near Ningpo (*Lophotragus michianus*). *Ibid.* 1874, pp. 452-454.
- TACZANOWSKI, L. Description d'un nouveau Cerf tacheté du pays d'Ussuri méridional (*Cervus dybowskii*). *Proc. Zool. Soc.* 1876, pp. 123-125.
- TRUE, F. W. Description of a new Species of Deer (*Cariacus clavatus*) from Central America. *Proc. U. S. Mus.* vol. xi. pp. 417-424 (1888).

WALSINGHAM, Viscount. On the Distribution of the different species of Deer and other Ruminants in Northern California and Oregon. *Proc. Zool. Soc.* 1873, pp. 561-563.

WHITAKER, J. A Descriptive List of the Deer Parks and Paddocks of England. London, 1892, 8vo.

WIEGMANN, A. F. A. Eine neue Art des Hirsch-geschlechtes. *Isis*, 1833, pp. 952-970.



FIG. 80.—Skull and Antlers of Caspian Red Deer. From a specimen shot in September 1891 by Mr. St. George Littledale in the Western Caucasus, at an elevation of about 6000 feet.

INDEX

- ACAPULCENSIS, *Cervus*, 263
 acuticornis, *Dama*, 196
 acuticornis, *Panolia*, 196
 affinis, *Cervus*, 88, 281
 Ahu, 230
 ahu, *Cervus*, 227
 albicornis, *Cervus*, 144
 albipes, *Cervus*, 204
 albipes, *Prox*, 204
 albirostris, *Cervus*, 91
 Alce, 18, 49, 125
 alce, *Alcelaphus*, 52
 alce, *Cervus*, 52
 Alcelaphus, 49
 Alces, 18, 49
 alces, *Alces*, 52
 alces, *Cervus*, 52
 alces latifrontis, *Cervus*, 59
 alfredi, *Axis*, 172
 alfredi, *Cervus*, 172
 alfredi, *Melanaxis*, 172
 altaicus, *Moschus*, 311
 Altai wapiti, 164
 ambiguus, *Cervus*, 239
 Ameghino's marsh-deer, 293
 American deer, 243
 americana couesi, *Mazama*, 261
 americana gymnotis, *Mazama*, 265
 americana macrura, *Mazama*, 257
 americana, *Mazama*, 249
 americana mexicana, *Mazama*, 261
 americana nemoralis, *Mazama*, 264
 americana osceola, *Mazama*, 259
 americana peruviana, *Mazama*, 267
 americana savannarum, *Mazama*, 266
 americana texana, *Mazama*, 261
 americana tolteca, *Mazama*, 263
 americana typica, *Mazama*, 252
 americanus, *Alce*, 52
 americanus, *Alces*, 52
 americanus, *Cariacus*, 249
 americanus, *Dorcelaphus*, 249
 americanus, *Moschus*, 303
 Amphitragulus, 215
 andicus, *Capreolus*, 296
 anoceros, *Dremotherium*, 217
 anoceros, *Cervus*, 217
 anoceros, *Dicrocerus*, 217
 Anoglochis, 19, 238
 Anomalocera, 294
 anomalocera, *Xenelaphus*, 295
 Antifer, 282
 antisiensis, *Cariacus*, 295
 antisiensis, *Cervus*, 295
 antisiensis, *Creagoceros*, 295
 antisiensis, *Furcifer*, 295, 296
 antisiensis, *Mazama*, 295
 apura, *Subulo*, 300
 arcticus, *Rangifer*, 47
 arcticus, *Tarandus*, 47
 Ardé deer, 239
 ardeus, *Anoglochis*, 239
 ardeus, *Cervus*, 239
 argyropus, *Hydropotes*, 221
 aristotelis, *Cervus*, 144
 aristotelis heterocervus, *Rusa*, 144
 aristotelis, *Hippelaphus*, 144
 aristotelis leschenaulti, *Rusa*, 144
 aristotelis nigra, *Rusa*, 144
 aristotelis, *Rusa*, 144
 aureus, *Cervulus*, 204
 aureus, *Stylocerus*, 204
 aurita, *Mazama*, 306
 auritus, *Cervus*, 269, 307
 auritus, *Coassus*, 306
 auritus, *Subulo*, 307
 Axis, 141
 axis, *Cervus*, 179
 axis ceylonensis, *Cervus*, 179
 azaræ, *Blastoceros*, 288
 azaræ, *Cervus*, 288
 BAHRAINJA, *Cervus*, 189
 barbarus, *Cervus*, 74
 Barren-ground reindeer, 47
 Basilan sambar, 158
 Bavian deer, 174
 bedfordianus, *Cervus*, 81
 belgrandi, *Cervus*, 139
 bezoartica, *Mazama*, 287
 bezoarticus, *Cervus*, 287
 bisulca, *Mazama*, 296
 bisulcus, *Equus*, 296
 Black-faced brocket, 302
 Black-tailed deer, 278
 Blastomeryx, 216
 Blastoceros, 20, 282
 Bokhara deer, 108
 borbonicus, *Cervus*, 240
 brachyceros, *Cariacus*, 291
 brachyceros, *Cervus*, 281, 291
 Browsers, 298
 brookei, *Cervus*, 151
 Brow-antlered deer, 197
 browni, *Cervus*, 131
 Brown's fallow deer, 131
 Buenos Aires marsh-deer, 292
 Burmese thameng, 200
 CALAMIANES DEER, 173
 Californian mule-deer, 276
 cambojensis, *Cervulus*, 193
 cambojensis, *Rucervus*, 193
 campestris, *Blastoceros*, 287
 campestris, *Cariacus*, 287
 campestris, *Cervus*, 287
 campestris, *Dorcelaphus*, 287
 campestris, *Furcifer*, 287
 campestris, *Mazama*, 287
 campestris, *Ozotoceros*, 288
 canadensis asiaticus, *Cervus*, 104
 canadensis eustephanus, *Cervus*, 105
 canadensis, *Cervus*, 94
 canadensis, *Elaphus*, 94
 canadensis luehdorfi, *Cervus*, 101
 canadensis occidentalis, *Cervus*, 101
 canadensis, *Strongyloceros*, 94
 canadensis typicus, *Cervus*, 96
 canadensis verus, *Cervus*, 96
 capræa, *Capreolus*, 224
 caprea, *Capreolus*, 224
 Capreolus, 19, 222
 capreolus, *Cervus*, 224
 capreolus fossilis, *Cervus*, 224
 capricornis, *Cervus*, 249
 cariacou, *Cervus*, 263
 cariacou, *Reduncina*, 263
 Caribou, 37

- caribou, Rangifer, 42
 Cariacus, 248
 carnutorum, Cervus, 140
 cashmerensis, Cervus, 83
 cashmeriensis, Cervus, 83
 cashmirianus, Cervus, 83
 cashmirianus yarcandensis, Cervus, 88
 cashmirianus typicus, Cervus, 85
 Caspian red deer, 75
 caspicus, Cervus, 186
 Cataglochis, 238
 Central American brocket, 303
 Central American deer, 264
 cephalophus, Elaphodus, 213
 Cervalces, 49
 Cervequus, 293
 Cervinae, 17, 32
 Cervulus, 19, 202
 Cervus, 18, 61, 62
 chilensis, Cariacus, 297
 chilensis, Cervus, 296
 chilensis, Creagoceros, 297
 chilensis, Furcifer, 295, 297
 chilensis, Pudu, 308
 chilensis, Xenelaphus, 295
 Chilian guemal, 296
 Chilian pudu, 307
 Chinese muntjac, 208
 Chinese water-deer, 221
 Chital, 179
 chrysogaster, Moschus, 311
 clactonianus, Cervus, 131
 cladoceros, Cervus, 239
 clavatus, Cariacus, 267
 clavatus, Cervus, 249
 Coassus, 298
 Colombian deer, 266
 columbiana, Mazama, 278
 columbianus, Cariacus, 278
 columbianus, Cervus, 278
 columbianus, Dorcelaphus, 278
 columbianus, Eucervus, 278
 columbicus, Cervus, 265
 Common American deer, 249
 Common sika, 111
 comosus, Blastoceros, 288
 comosus, Cervus, 288
 concolor, Moschus, 312
 coronatus, Cervus, 52
 Corsican red deer, 74
 corsicanus, Cervus, 74
 Cosoryx, 216
 couesi, Dorcelaphus, 261
 Creagoceros, 294
 crinifrons, Cervulus, 210
 crookei, Mazama, 268
 Crooke's black-tailed deer, 268
 crooki, Dorcelaphus, 268
 culionensis, Cervus, 173
 curvostylis, Cervulus, 204
 cusanus, Capreolus, 232
 cusanus, Cervus, 232
 cylindroceros, Cervus, 239
 DACTYLOCEROS, 125
 Dama, 18, 125
 dama americana, Cervus, 249
 dama browni, Cervus, 131
 dama, Cervus, 127
 dama, Dactyloceros, 127
 dama, Dama, 127
 dama, Palmatus, 127
 Damine group, 125
 davidianus, Cervus, 236
 davidianus, Elaphurus, 236
 dawkinsi, Cervus, 140
 dejeani, Cervus, 156
 Desert mule-deer, 277
 dichotoma, Mazama, 283
 dichotomus, Cervus, 283
 dicranius, Cervus, 240
 dicranoceros, Cervulus, 217
 dicranoceros, Cervus, 217
 Dicroceros, 19, 218
 dimorpha, Axis, 190
 dimorpha, Rusa, 189
 dimorphe, Cervus, 189
 dolichurus, Cervus, 300
 dolichurus, Subulo, 300
 Dorcelaphus, 20, 248
 Doryceros, 299
 Dremotherium, 19, 215
 dubius, Hippocamelus, 296
 Duke of Bedford's deer, 81
 duvauceli, Cervus, 189
 duvaucellii, Axis, 189
 duvaucellii, Rucervus, 189
 dybowskii, Cervus, 91, 117
 EAST AMERICAN WAPITI, 96
 Ecuador pudu, 308
 cecidii, Panolia, 196
 Elaphine group, 62
 Elaphoceros, 110
 Elaphodus, 19, 212
 elaphoides, Cervus, 189
 Elaphurus, 19, 233
 Elaphus, 62
 elaphus antiqui, Cervus, 75
 elaphus barbarus, Cervus, 74
 elaphus canadensis, Cervus, 94
 elaphus, Cervus, 64
 elaphus corsicanus, Cervus, 74
 elaphus minor, Cervus, 74
 elaphus germanicus, Cervus, 65
 elaphus maral, Cervus, 75
 elaphus typicus, Cervus, 65
 elaphus varius, Cervus, 75
 elegans, Dicroceros, 218
 eldi, Cervus, 195
 eldii, Panolia, 196
 eldi platyceros, Cervus, 200
 eldi typicus, Cervus, 200
 Elk, 49, 52
 ensenadensis, Paraceros, 283
 Epicuryceros, 282
 equina pennantii, Rusa, 151
 equina, Rusa, 151
 equinus, Cervus, 150
 equinus, Hippelaphus, 151
 etueriarum, Cervus, 122
 euceros, Cervus, 189
 Eucervus, 248
 Eucladoceros, 238
 eucladoceros, Cervus, 189
 euöpis, Cervus, 112
 europæus, Capreolus, 244
 European red deer, 65
 European roe, 224
 euryceros belgrandi, Cervus, 139
 euryceros carnutorum, Cervus, 140
 euryceros, Cervus, 134
 euryceros dawkinsi, Cervus, 140
 euryceros germania, Cervus, 136
 euryceros hibernia, Cervus, 137
 euryceros italia, Cervus, 139
 eustephanus, Cervus, 105
 FALLOW DEER, 127
 fasciatus, Moschus, 311
 fea, Cervulus, 209
 fitchii, Cervus, 140
 Five-tined deer, 242
 Florida deer, 259
 Formosan sambar, 154
 Formosan sika, 116
 fossilis, Capreolus, 224
 fragilis, Cariacus, 293
 fragilis, Cervus, 293
 fragilis, Mazama, 293
 fragilis, Paraceros, 293
 frontalis, Cervus, 196
 frontalis, Panolia, 196
 furcata, Mazama, 283
 furcatum, Dremotherium, 217
 furcatus, Palæomeryx, 217
 furcatus, Prox, 217
 Furcifer, 294
 GIANT FALLOW DEER, 134
 gigantea, Alce, 134
 giganteus belgrandi, Cervus, 139
 giganteus carnutorum, Cervus, 140
 giganteus, Cervus, 134
 giganteus italia, Cervus, 139
 giganteus ruffi, Cervus, 136
 giganteus typicus, Cervus, 137
 goudotii, Cervus, 265
 Greenland reindeer, 47
 Guazu deer, 282
 Guemals, 293

- guettardi, *Cervus*, 37
 gunnii, *Cervus*, 140
Gymnotis, 248
gymnotis, *Cariacus*, 265
gymnotis, *Cervus*, 265

 HAIRY-FRONTED MUNTJAC, 210
 Hangul, 83
hastalis, *Cervus*, 42
hastalis, *Tarandus*, 42
hemionus californica, *Mazama*, 276
hemionus, *Cervus*, 269
hemionus, *Dorcilaphus*, 270
hemionus eremicus, *Mazama*, 277
hemionus eremicus, *Dorcilaphus*, 277
hemionus, *Mazama*, 269
hemionus peninsulae, *Mazama*, 276
hemionus typica, *Mazama*, 275
 Hensel's muntjac, 217
heterocervus, *Rusa*, 144
hibernicus, *Megaceros*, 134
hibernus, *Cervus*, 134
 Himalayan musk, 311
Hippelaphus, 141
hippelaphus, *Cervus*, 162
hippelaphus moluccensis, *Cervus*, 166
hippelaphus, *Rusa*, 162
hippelaphus timoriensis, *Cervus*, 170
hippelaphus typicus, *Cervus*, 164
Hippocamelus, 293
 Hog-deer, 175
Homelaphus, 298
hortulorum, *Cervus*, 117
Huamela, 294
huamel, *Anomalocera*, 295
huamel, *Auchenia*, 296
huamel, *Furcifer*, 296
huamel, *Xenelaphus*, 295
humboldtii, *Cervus*, 303
humboldtii, *Subulo*, 303
humilis, *Cervus*, 308
humilis, *Pudua*, 308
Hydelaphus, 19, 219
Hydropotes, 219
Hylaphus, 142

 INDIAN SAMBAR, 146
 Indian spotted deer, 179
inermis, *Hydelaphus*, 221
inermis, *Hydropotes*, 221
inornata, *Mazama*, 306
inornatus, *Coassus*, 306
inornatus, *Homelaphus*, 306
 Irish elk, 134
islandicus, *Cervus*, 134
issiodorensis, *Cervus*, 122

isubra, *Cervus*, 102
 Isubra deer, 103

 JAPANESE SIKA, 112
japonica, *Rusa*, 112
japonicus, *Cervus*, 111
jarai, *Cervus*, 144
jarya, *Rusa*, 144
Javan sambar, 162, 164
 Johnson's elk, 59
jubata, *Alces*, 52

 KANSU MUSK, 315
 Kashmir stag, 85
 Kaup's muntjac, 217
kopschi, *Cervus*, 114
kuhli, *Cervus*, 174
kuhli, *Rusa*, 174

 LACHRYMANS, *Cervulus*, 208
 La Paz mule-deer, 276
latifrons, *Alces*, 59
latifrons, *Cervus*, 59
lepida, *Rusa*, 185
lepidus, *Cervus*, 185
leptocephala, *Mazama*, 281
leptocephalus, *Cariacus*, 281
leschenaultii, *Hippelaphus*, 144
leschenaultii, *Cervus*, 144
leucogaster, *Cervus*, 287
leucogaster, *Moschus*, 311
leucotis, *Capreolus*, 296
leucotis, *Huamela*, 297
leucotis, *Xenelaphus*, 295
leucurus, *Cariacus*, 258
leucurus, *Cervus*, 257
leucurus, *Mazama*, 258
lewisii, *Cervus*, 278
lobata, *Alces*, 52
lobata coronata, *Alces*, 52
lobatus, *Cervus*, 52
Lophotragus, 212
luchdorfi, *Cervus*, 102
lujanensis, *Cervus*, 291
Lujan marsh-deer, 291
Luzon sambar, 157
lyratus, *Cervus*, 196

 MACHLIS, *Alces*, 52
Macrotis, 248
macrotis californicus, *Cariacus*, 276
macrotis, *Cariacus*, 269
macrotis, *Cervus*, 269
macrotis columbianus, *Cariacus*, 278
macrotis columbianus, *Cervus*, 278
macrotis, *Dorcilaphus*, 269
macrotis, *Eucervus*, 269
macrotis, *Mazama*, 269
macrotis montanus, *Cervus*, 275

macrotis, *Otelaphus*, 269
macrourus, *Cervus*, 257
macrourus, *Mazama*, 257
macrurus, *Dorcilaphus*, 258
maculata, *Axis*, 179
maculata ceylonensis, *Axis*, 179
maculatus, *Hylaphus*, 179
maculatus, *Moschus*, 312
malaccensis, *Cervus*, 151
 Malayan sambar, 150
malchis, *Alces*, 52
 major, *Axis*, 179
 Manchurian roe, 231
 Manchurian sika, 114
 Manchurian wapiti, 102
manchuricus, *Capreolus*, 231
 Mandarin sika, 121
mandarinus, *Cervus*, 121
mantchurica, *Pseudaxis*, 114
mantchuricus, *Cervus*, 114
mantchuricus, *Elaphoceros*, 114
mantchuricus, *Axis*, 114
mantchuricus major, *Cervus*, 121
 Maral, 79
maral asiatica, *Cervus*, 104
maral, *Cervus*, 75
marianna, *Rusa*, 157
mariannus, *Cervus*, 157
marianus, *Hippelaphus*, 157
 Marsh-deer, 283
matheroni, *Capreolus*, 232
mauricus, *Cervus*, 127
 Mazama, 20, 243, 248, 298
mediterraneus, *Cervus*, 74
Megaceros, 125
megaceros, *Cervus*, 134
megaceros rutli, *Cervus*, 136
Melanaxis, 142
melas, *Cervus*, 204
melas, *Prox*, 204
mephistopheles, *Pudua*, 308
 Mesopotamian fallow deer, 132
mesopotamica, *Dama*, 132
mesopotamicus, *Cervus*, 132
 Mexican deer, 261
mexicana, *Mazama*, 261
mexicana, *Reduncina*, 262
mexicanus, *Cariacus*, 261
mexicanus, *Cervus*, 261
michianus, *Elaphodus*, 214
michianus, *Lophotragus*, 214
 Michie's tufted deer, 214
Micromeryx, 215
micrurus, *Cervulus*, 209
 Milou deer, 233
 minor, *Axis*, 179
 minor, *Cervus*, 176
 Miocene muntjacs, 215
 Moluccan rusa, 166
moluccensis, *Cervus*, 166
moluccensis, *Hippelaphus*, 166

- moluccensis, Rusa, 166
 Moose, 52
 moschatus, Cervulus, 203
 moschatus, Prox, 204
 moschatus, Stylocerus, 204
 moschiferus, Moschus, 311
 Moschinae, 21, 309
 Moschus, 21, 310
 Mule-deer, 269
 muntjac, Cervulus, 203
 muntjac, Cervus, 203
 muntjac, Prox, 204
 Muntjacs, 202
 Muntjac, Stylocerus, 204
 Muntjacus, 202
 Musks, 310
 muswa, Alces, 52
- NAMBI, Nanelaphus, 305
 nana, Mazama, 305
 Nanelaphus, 298, 307
 nanus, Cariacus, 305
 nanus, Cervus, 305
 nanus, Coassus, 305
 nanus, Subulo, 305
 nariyanus, Cervus, 91
 nemoralis, Cariacus, 264
 nemoralis, Cervus, 264
 nemoralis, Mazama, 264
 nemoralis, Reduncina, 264
 nemorivaga, Mazama, 303
 nemorivagus, Cariacus, 304
 nemorivagus, Coassus, 303
 nemorivagus, Doryceros, 304
 nemorivagus, Cervus, 303
 nemorivagus, Passalites, 303
 nemorivagus, Subulo, 303
 nepalensis, Rusa, 144
 neschersensis, Cervus, 232
 Newfoundland reindeer, 45
 niger, Cervus, 144
 niger, Hippelaphus, 144
 nigricans, Cervus, 158
 nigricans, Ussa, 158
 North African red deer, 74
 nudipalpebra, Cervus, 179
- OCCIDENTALIS, Cervus, 101
 occidentalis, Elaphus, 101
 occidentalis, Strongyloceros, 101
 Ollen, 77
 oryzus, Axis, 176
 osceola, Cariacus, 259
 osceola, Dorcelaphus, 259
 Otelaphus, 248
 Ozotoceros, 282
- PALÆOMERYX, 215
 palæoplatensis, Cervus, 291
 Palmatus, 125
 palmatus, Alces, 52
- paludosa, Mazama, 283
 paludosus, Blastoceros, 283
 paludosus, Cariacus, 283
 paludosus, Cervus, 283
 paludosus, Dorcelaphus, 283
 palustris, Cariacus, 283
 palustris, Cervus, 283
 Pampas deer, 287
 Panolia, 188
 Para, 175
 Paraceros, 282
 paradoxa, Rusa, 157
 pardinensis, Cervus, 122
 Passalites, 298
 Pekin sika, 117
 pennanti, Axis, 151
 Père David's deer, 236
 peronii, Cervus, 170
 peronii, Hippelaphus, 170
 peronii, Rusa, 170
 perrieri, Cervus, 122
 Peruvian brocket, 305
 Peruvian deer, 267
 Peruvian guemal, 294
 peruvianus, Cariacus, 267
 peruvianus, Coassus, 267
 Philippine spotted deer, 172
 philippinus, Cervus, 157
 philippinus, Rusa, 157
 philippinus, Stylocerus, 157
 Pigmy brocket, 305
 platycercus, Panolia, 200
 Platyceros, 125
 platyceros, Cervus, 127
 platyceros, Dama, 127, 200
 platyceros, Panolia, 200
 Pliocene roe, 232
 Pliocene sika, 122
 Pliocene guemal, 298
 Polycladus, 238
 polycladus, Cervus, 239
 porcinus, Axis, 175
 porcinus, Cervus, 175
 porcinus, Hyclaphus, 175
 primigenius, Cervus, 65
 priscus, Cervus, 65
 Propalæomeryx, 215
 Prox, 202
 Pseudaxis, 18, 110
 pseudaxis, Axis, 123
 pseudaxis, Cervus, 117, 123
 pseudaxis, Sikelaphus, 123
 Pseudocervus, 62
 Pudu, 307
 Pudua, 20, 307
 pudu, Capra, 307
 pudu, Cervus, 308
 pudu, Nanelaphus, 308
 pudu, Ovis, 307
 pudu, Pudua, 307
 pumilio, Axis, 175
- pumilio, Cervus, 175
 punctulata, Reduncina, 278
 punctulatus, Cariacus, 278
 punctulatus, Otelaphus, 278
 pusilla, Mazama, 281
 pusillus, Eucervus, 281
 pygargus, Capreolus, 227
 pygargus, Cervus, 227
 pygargus mantschuricus, Cervus, 231
- RAMOSUS, Cervus, 239
 Rangifer, 18, 33
 rangifer, Tarandus, 37
 ratva, Prox, 204
 ratwa, Cervus, 204
 ratwak, Stylocerus, 204
 Recurvus, 188
 Red brocket, 300
 Red deer, 62, 64
 Reduncina, 248
 reevesi, Cervulus, 208
 reevesii, Cervus, 208
 Reindeer, 33, 37
 richardsonii, Cervus, 278
 richardsonii, Otelaphus, 278
 Rocs, 222
 roosevelti, Cervus, 101
 Rucervus, 18, 188
 rufa, Mazama, 300
 ruffi, Cervus, 136
 rufinus, Cariacus, 302, 303
 rufinus, Cervus, 302
 rufinus, Coassus, 302
 rufinus, Subulo, 302
 rufus, Cariacus, 300
 rufus, Cervus, 300
 rufus, Coassus, 300
 rufus, Subulo, 300
 Rusa, 18, 141, 162
 Rusine group, 141
 rusoides, Cervus, 123
 russa, Cervus, 162
 russa moluccensis, Cervus, 166
 russa timoriensis, Cervus, 170
- SAMBAR, 144
 sartorii, Cervus, 303
 sartorii, Mazama, 303
 saturatus, Moschus, 311
 Savanna deer, 266
 savannarum, Cariacus, 266
 savannarum, Cervus, 266
 savannarum, Reduncina, 266
 savini, Cervus, 131
 Scandinavian reindeer, 38
 scheuchzeri, Palæomeryx, 217
 schomburgki, Cervus, 193
 schomburgkii, Rucervus, 193
 Schomburgk's deer, 193
 schottini, Cervus, 37

- selateri, Cervulus, 208
 sedgwicki, Anoglochis, 240
 sedgwicki, Cervus, 241
 sedgwickii, Eucladoceros, 240
 Sedgwick's deer, 240
 senelutica, Mazama, 298
 seneliticus, Cariacus, 298
 seneliticus, Cervus, 298
 Shou, 88
 Siamese thameng, 200
 Siberian roe, 227
 sibiricus, Moschus, 311
 sica, Cervus, 111
 sica manchuricus, Cervus, 114
 sica typicus, Cervus, 112
 sifanicus, Moschus, 315
 Sika, 110
 sika, Axis, 112
 sika, Cervus, 111
 sika, Elaphoceros, 112
 sika, Pseudaxis, 112
 Sikelaphus, 110
 Sikine group, 110
 similis, Cervus, 281
 similis, Mazama, 281
 similis, Reduncina, 281
 simplicicornis, Cariacus, 304
 simplicicornis, Cervus, 303
 simplicicornis, Coassus, 304
 simplicicornis major, Cervus, 305
 simplicicornis, Subulo, 303
 sivalensis, Cervus, 201
 Siwalik swamp-deer, 201
 smithii, Cervus, 196
 Sonoran deer, 261
 spelæus, Strongyloceros, 75
 spinosa, Mazama, 280
 spinosus, Cariacus, 280
 spinosus, Cervus, 280
 Spitzbergen reindeer, 41
 steerii, Cervus, 159
 Streak-eyed brocket, 301
 Strongyloceros, 62
 strongyloceros, Cervus, 94
 Stylocerus, 202
 stylocerus, Prox, 204
 subcornutus, Cervulus, 204
 subcornutus, Stylocerus, 204
 Subulo, 298
 sulcatus, Furfifer, 298
 superciliaris, Cariacus, 302
 superciliaris, Cervus, 301
 superciliaris, Coassus, 302
 superciliaris, Mazama, 302
 superciliaris, Subulo, 302
 Swamp-deer, 189
 swinhoii, Cervus, 154
 Szechuan sambar, 156
 TAËVANUS, Cervus, 116
 taëvanus, Elaphoceros, 116
 taïouanus, Cervus, 116
 taïvanus, Axis, 116
 taïvanus, Pseudaxis, 116
 tamulicus, Cervulus, 204
 Tarandus, 33
 tarandus arcticus, Cervus, 47
 tarandus arcticus, Rangifer, 47
 tarandus caribou, Rangifer, 42
 tarandus, Cervus, 37
 tarandus grœnlandicus, Cervus, 47
 tarandus grœnlandicus, Rangifer, 47
 tarandus, Rangifer, 37
 tarandus spetzbergensis, Rangifer, 41
 tarandus sylvestris, Cervus, 42
 tarandus terræ-novæ, Rangifer, 45
 tarandus typicus, Rangifer, 38
 tema, Cariacus, 302
 tema, Mazama, 302
 Tenasserim muntjac, 209
 terræ-novæ, Rangifer, 45
 tetraceros, Anoglochis, 242
 tetraceros, Cervus, 242
 Texan deer, 261
 texanus, Dorcelaphus, 261
 Thameng, 195
 thoroldi, Cervus, 91
 Thorold's deer, 91
 Tibetan muntjac, 208
 Tibetan tufted deer, 213
 timorensis, Cervus, 170
 Timorese rusa, 170
 timoriensis, Cervus, 170
 timoriensis, Hippelaphus, 170
 toltecus, Cariacus, 263
 toltecus, Cervus, 263
 toltecus, Coassus, 263
 trigonoceros, Cervus, 217
 True's deer, 267
 truci, Mazama, 267
 tschudii, Cervus, 305
 tschudii, Doryceros, 305
 tschudii, Mazama, 305
 tschudii, Subulo, 305
 Tufted deer, 212
 tunjac, Cervus, 162
 Tuskless muntjacs, 218
 Typical deer, 61
 ULTRA, Antifer, 292
 ultra, Cariacus, 292
 ultra, Cervus, 292
 ultra, Mazama, 292
 unicolor, Cervus, 144
 unicolor dejeani, Cervus, 156
 unicolor equinus, Cervus, 150
 unicolor nigricans, Cervus, 158
 unicolor philippinus, Cervus, 157
 unicolor, Rusa, 144
 unicolor swinhoii, Cervus, 154
 unicolor typicus, Cervus, 146
 Ussa, 142
 VAGINALIS, Cervulus, 204
 vaginalis, Cervus, 203
 vaginalis, Muntjacus, 204
 verticornis, Cervus, 140
 Virginian deer, 252
 virginiana, Mazama, 249
 virginiana, Reduncina, 249
 virginianus, Cervus, 249
 virginianus, Dorcelaphus, 249
 virginianus mexicanus, Cariacus, 262
 vulgaris, Capreolus, 224
 vulgaris, Dama, 127
 WALLICHII, Cervus, 83, 88
 wallichii, Pseudocervus, 88
 Wapiti, 94
 wapiti, Cervus, 94
 Water-deer, 218
 West American wapiti, 101
 Western American deer, 257
 whitelyi, Cariacus, 305
 whitelyi, Coassus, 305
 wiegmanni, Gymnotis, 265
 Wood-brocket, 303
 Woodland reindeer, 42
 XANTHOPYGUS, Cervus, 81
 Xenelaphus, 20, 293
 YARCANDENSIS, Cervus, 88
 Yarkand stag, 88
 Yucatan deer, 263
 yucatanensis, Cervus, 263

Printed by R. & R. CLARK, LIMITED, Edinburgh.

f 599.735

L 983



